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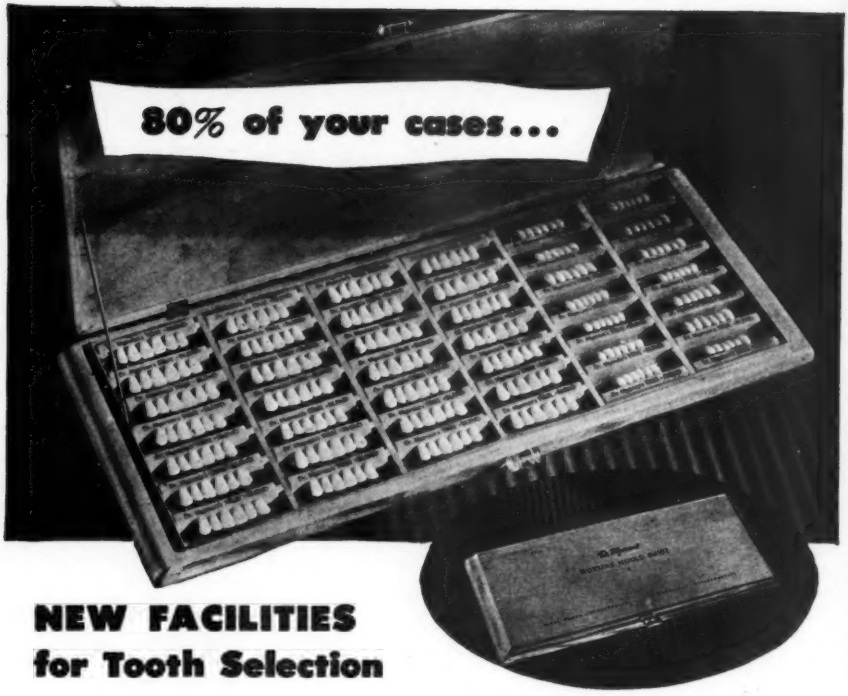

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THE Journal OF THE
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DECEMBER 1, 1946 • VOLUME 33 • NUMBER 23

A CENTURY OF CLINICAL ANESTHESIA AND 100 YEARS OF CONTROVERSY

Howard R. Raper, D.D.S., Albuquerque, N. Mex.

EVERYBODY knows that "time marches on," and nobody is likely to be startled by the news that October 16, 1946, is the centenary anniversary of the introduction of ether anesthesia into surgical practice. What is more surprising is that the same date comes close to being the one hundredth birthday of the controversy over who should be called the discoverer of anesthesia.

A hundred years is a long time to quarrel about anything, and it occurs to me that there could be no nicer way of celebrating the advent of anesthesia than to make a sincere effort, at this time, to come to an agreement—to make this date mark the end, or at least the beginning of the end, of the controversy.

The task of settling the differences of opinion is a presumptuous, perhaps even a foolhardy, thing to undertake, but there are signs that it may not be as impossible as is commonly supposed. Taking advantage of my position in time and looking back at the conflict, it seems to me that much of the battling has been more remarkable for the amount of noise created than the seriousness of the differences involved. It has reminded me, at times, of dogs barking ferociously at one another, with a fence between them. If you have ever witnessed that performance, I hope you did not overlook the most significant thing about it: the way the dogs, by common consent, dashed by the open gate and the holes in the fence, ignoring such unwelcome opportunities of getting together and really settling their differences—either by bloodshed or amicable agreement.

But it is not my intention to insinuate or pretend that the conflict over the discovery of anesthesia may be taken lightly. It is too serious a matter, one too marked with bitterness and shame, for that. Its spots of comic relief are few and far between. It led, in the early days, to stark tragedy; and, to this day, it is scarred with regrettable distortion and injustice.

Nevertheless, I am hopeful that the matter may finally be settled. I am, in fact, more hopeful right now than I ever have been before. Your invitation to speak in Boston is a most encouraging sign; for, in case some of you may not

Presented in part at the Morton Centenary Celebration of the Massachusetts Dental Society, Boston, October 15, 1946.

know it, I have never been classified as an ardent Morton partisan. I have a sincere desire to be fair to Dr. Morton, but I cannot be counted on to ignore certain historic facts in order to make a standard-brand, legendary hero of him. Knowing this, you have, nevertheless, invited me to take part in your celebrations. There have been instances in the past when speakers for celebrations comparable to this one were judged and selected solely on the basis of their party affiliations. Your committee breaks sharply with this tradition, takes a chance and, let us hope, sets a new style.

Nor is your invitation the only evidence that has come my way recently of a growing willingness to agree on the essential facts relating to the discovery of anesthesia. A year ago I published a book[1] in which I did my best to tell the true story of the discovery, "let the chips fall where they may." My purpose in writing the book was a rather ambitious, double-barreled one. In the first place, I wanted to salvage and preserve an important historic story which was well on its way to being lost, and, in addition, I aspired to make a contribution, however slight, toward settling the controversy. I felt reasonably confident of achieving the first of my two aims, but extremely dubious about the second.

Since I tried to be no more than fair to any of the candidates for the honor of the discovery, I was well aware of the fact that the risk I ran was one of being attacked, not by any special group of partisans, but by all of them! There is, of course, still time for this to happen, and I make no predictions that it will not. In the meantime, however, I find myself in the position of the nervous man waiting for the other shoe to drop; for, up to date, I have been amazed at the kindly attitude of people toward both the book and its author. Even avowed partisans have not yet become abusive, and not a few have credited me with at least trying to be fair. This indicates a remarkable change in public attitude toward the subject, for had the equivalent of this same book appeared twenty-five or fifty years ago it immediately would have become the target of bitter denunciation.

Perhaps these personal experiences make me overoptimistic. Maybe people are not as sweetly reasonable as, at the moment, they seem to me to be, or they may have a sudden change of heart. Time will tell. Be all that as it may, my present feeling is that men are at last tired of arguing and inclined to allow the matter to be settled. If this is true, it can be settled; if not, no suggestion, no book, no man, no army can settle it.

Early Surgery

Having convinced myself at least, if not my audience, that a sincere effort to settle the controversy may not be entirely fruitless, let me go on to a brief rehearsal of the story of the discovery. But before I do that, allow me an attempt to give you some idea of what surgery was like before anesthesia came to the rescue.

Since I do not know from personal experience what such surgery was like, I turn the gruesome task of describing it over to an anonymous newspaper reporter whose account of an amputation without anesthesia appeared in the July 21, 1841, issue of the *New York Herald*. I warn you, this particular reporter was a good one. He was far more interested in recording precisely what he saw and heard than in sparing the feelings of his readers. His story is vivid, and I warn you again, it is ghastly. But if we are to appreciate anesthesia—and that, I take it, is a part of the purpose of this celebration—we cannot ignore the necessity of learning what it has to teach. The newspaper report follows:

> The case was an interesting one of white swelling, for which the thigh was to be amputated.

1. Raper, H. R.: *Man Against Pain*. New York: Prentice-Hall, Inc., 1945.

The patient was a youth of about fifteen, pale, thin, but calm and firm. One professor felt for the femoral artery, had the leg held up for a few moments to insure the saving of blood. The compress part of the tourniquet was placed upon the artery and the leg held up by an assistant.

The white swelling was fearful—frightful. A little wine was given the lad. He was pale but resolute. His father supported his head and left hand.

A second professor took the long glittering knife, felt for the bone, thrust in the knife carefully but rapidly. The boy screamed terribly; the tears went down the father's cheeks. The first cut from the inside was completed, and the bloody blade of the knife issued from the quivering wound. The blood flowed by the pint. The sight was sickening; the screams terrific; the operator calm.

Again the knife was thrust under the bone. The terrific screaming was renewed. One or two picked up their hats to leave. Scream upon scream, and again the bloody blade of the knife issued from the wound and was laid aside. The flesh quivered and the boy cried agonizingly.

The flesh was thrust back with a small piece of wet linen. The divided ends of the quivering muscles were stopped from blood with a sponge. The saw glistened in the hands of the operator; the father turned pale as death; the boy's eyes fastened on the instrument with glazed agony. Grate—crush—once, twice, and the useless limb from the toes to the center of the thigh, was quickly dropped into the tub under the table. . . .

Some members of this audience no doubt also nearly "picked up their hats to leave." And I presume that some of you feel that you now have a reasonably clear idea of what surgery was like without anesthesia. But I wonder if you have, if any of us have; for hearing the description of a thing is far different from seeing or experiencing it firsthand.

The Discovery

Any investigator, having the inclination, the facilities and the endurance to dig long and deep enough through the avalanche of distortion, dissension and make believe that covers the historical record of the discovery of anesthesia, is likely to be astonished at what a simple, convincing story he finally uncovers. And he is likely also to be surprised at finding how similar it is in basic outline to the story of the recent discovery of penicillin.

In 1929, Alexander Fleming chanced upon a Petri plate of growing bacteria on which there was a contaminating spot or two of mold. He observed that the bacteria did not grow in the vicinity of the mold. Sensing the significance of what he saw, he was, to quote the doctor himself, "sufficiently interested . . . to pursue the subject"—and to report the results of that pursuit. He did not introduce the antibacterial substance he found in the mold, which he called "penicillin," into clinical medical practice. Instead, he passed it and the inspiration for its clinical use along to Howard W. Florey and his associates, whose work resulted in its introduction into medical practice twelve years later, in 1941.

In 1844, Horace Wells chanced to see a man, drunk from inhaling laughing gas, batter his shins against a bench, without manifesting any sign of pain. Like Fleming, he sensed the significance of what he had seen, and was sufficiently interested to put his theory of anesthesia to the test, prove it by experiment, and announce his results. Again, like Fleming, he did not introduce his discovery into medical practice, although he tried to do so. He succeeded only in passing the idea and inspiration along to his one-time pupil and associate, W. T. G. Morton, who introduced the method into surgical practice twenty-one months later.

And there you have, stripped of all details, the essential facts about the discovery of both penicillin and anesthesia. There is, as I have said, a striking parallel between the two. And, it may be mentioned in passing, there is also a striking contrast between the two discoveries.

The contrast lies in the differing de-

grees of credit accorded the various discoverers. In the case of anesthesia, Morton, who introduced the method, has received greater recognition than Wells, who originated the idea. In the case of penicillin, Fleming, who originated the idea, has received far more recognition than Florey, who introduced it. One reason for the unstinted credit accorded Fleming is that Florey and his co-workers have never denied Fleming the credit due him. Morton, on the other hand, denied all obligation to Wells—thus introducing such an element of confusion that we are still victims of it. Although the general public still lavishes undivided credit on Fleming for penicillin, it is noteworthy that the 1945 Nobel Prize in Medicine was divided among Fleming, Florey and E. B. Chain.

The Introduction

I said, a moment ago, that Horace Wells tried to introduce anesthesia into surgical practice. I was referring to his trip to Boston in January 1845, when he gave a demonstration of the use of nitrous oxide during extraction of a tooth. Let us go into that incident sufficiently to show how needlessly harsh many writers and speakers have been in their accounts of the event. The most significant thing about the trip is that, although it was made in good faith and with high hope, it failed to accomplish its main objective, which was to introduce anesthesia into surgical practice. Taking their clew from the fact that it failed, in its immediate effect, to accomplish its purpose, authors have forthwith decided to blame and criticize somebody.

Some have heaped all blame on Wells, writing in essence such things as: "He was nervous and fearful, bungled the demonstration badly, and when the patient screamed as the tooth was extracted, beat a hasty retreat to Hartford, and was not heard from again until another man had succeeded in doing what he had failed to do."

Others have directed their blame and criticism at the audience and the members of the staff of the Massachusetts General Hospital. Sir James Y. Simpson wrote to Jacob Bigelow saying, "Did not your school (by its failure to recognize anesthesia when it was brought to your attention by Horace Wells) stamp out, and thus prevent for two years more, the 'most beneficent discovery . . . which has blessed humanity since the primeval days of paradise'?" Simpson was angry at Boston medical men. Some of them were saying that his chloroform was not entirely satisfactory, or at least not nearly as satisfactory as ether.

It seems to me that we would do well, at this time, to be less free with our criticism of people, and devote more of our energy to an analysis of the circumstances. There is much to be said in defense of both Wells and the audience. Give a modern anesthetist the same equipment that Wells used, let him assume the dual role of anesthetist and surgeon, and his demonstration might turn out to be no better than that of Wells. As for the alleged stupidity of the audience, let us not forget that the only recognized anesthetist of the time was God, Himself ("And the Lord God caused a deep sleep to fall on Adam," etc.). It is not surprising that the audience was skeptical of the ability of a country dentist to perform miracles. The critics who blandly assume that the significance of the Wells demonstration would not have escaped them had they witnessed it, were and still are, I think, deluding themselves as we are all prone to do when supplied beforehand with the answer to a puzzle. It is easy enough to know how to make the egg stand on end after we have been shown the trick of flattening the rounding surface by breaking the shell.

Nor should we, in my opinion, continue, as we have been doing for a century, to consider the Wells demonstration a complete failure. It was a step along

the road to success. It fertilized Morton's mind. It gave him warning of the mistake of taking the inhaler away too soon. It sensitized the minds of Boston medical men, making them more receptive to the same idea when Morton offered it to them a second time. In short, it paved the way to success, as so-called failures so often do.

The Discoverers

We now come to the most crucial part of this discourse, to the point where we set down the terms for settling the controversy, and to the necessity of trying to answer the perennially provocative question: Who should be named the discoverer of anesthesia? It is not, to put it mildly, an easy question to answer satisfactorily.

If we name Sir Humphry Davy, objections to him will be raised on the ground that he did no more than suggest that nitrous oxide might be used in surgery and that nobody who knew of the suggestion, including Davy himself, ever did anything further about it.

If we name Henry Hill Hickman, objection to him will be raised on the ground that his efforts were fruitless, that his experiments did not include the use of an effective anesthetic agent, and that his approach to the problem was basically wrong in that what he sought to do was to suffocate the patient instead of subjecting him to the therapeutic action of an anesthetic agent. The English, who are frequently more careful about such things than we are in America, usually speak of Hickman simply as "a pioneer in anesthesia," a title which can be granted him without question.

If we name Charles T. Jackson, objection to him will be raised on the ground that he did no more than assist Morton, by discussing the matter with him and proposing that ether be substituted for nitrous oxide gas. This was a valuable and practical suggestion, indeed, but hardly important enough to win him the title of discoverer in such a competitive field.

If we name Crawford W. Long, Georgia may cheer, but others will object on the ground that, to quote William H. Welch, "We cannot assign to him any influence upon the historical development of surgical anesthesia, or any share in the introduction to the world at large of the blessings of this matchless discovery."[2]

If we name E. R. Smilie, objection to him will be made on the ground that, although he used a mixture of ether and opium, in 1842, to anesthetize a surgical patient or two, he mistook the action of the ether for the action of opium, and allowed well-meaning friends to scare him out of continuing his experiments.

If we name Horace Wells, objection to him will be made on the ground that he did not finish the job he started, that he did not succeed in introducing anesthesia into surgical practice.

And if we name William T. G. Morton, objection to him will be made on the grounds that he got his idea of anesthesia from Horace Wells.

It is obvious, from the foregoing, that no single candidate can be named discoverer without stirring up indignant opposition. And, for some reason, little else has been done for the last hundred years than to try to pin all honor and credit on just one man. This, as we should know by now, will not lead to anything resembling the settlement we seek.

So why not try a new method? Why not name more than one man, on the theory that perhaps no one man earned the title? This, too, has been tried without success. But the failure has been due, I think, to the unsound motives of those who have attempted it. It has been advocated by those who would have peace at any price, whose aim has been simply to pacify partisans, regardless of

2. Welch, W. H.: *A Consideration of the Introduction of Surgical Anesthesia.* Boston: The Barta Press, 1908.

justice, and who believe that the matter may be settled by envoking the law of political expediency—a plan that is as unworkable as it is unworthy.

How far astray this policy may lead its advocates was revealed on a national radio broadcast, in 1944, when an announcer solemnly informed his audience that "eight men discovered anesthesia." And he then named the following eight: Raymond Lully, Paracelsus, Joseph Priestley, Humphry Davy, Michael Faraday, Crawford Long, Horace Wells and W. T. G. Morton. The commercial sponsor of the program was taking no chances, if he could avoid it, of offending anybody. Why Hippocrates was slighted, I can't imagine!

No, the mere expedient of naming more than one man for the honor is not enough. We must make it a point to name the right men. And how may we find the right ones? Here is one way:

> Instead of arguing about the meaning of the word discovery and laboriously analyzing the qualifications of each candidate, as is usually done, suppose we make a little different approach. Taking the fact that prior to the nineteenth century there was no such thing as surgical anesthesia as we know it, and the further fact that we now do have it, let us trace backward and see where it came from. Doing this, we come immediately to Morton's famous ether demonstration at the Massachusetts General Hospital on October 16, 1846. Going back of this to see where Morton got his idea, we are led at once to Horace Wells . . . who used nitrous oxide for surgical purposes and told Morton and many others about it in 1844 and 45. And there the trail of closely interdependent events stops. . . .[1]

Viewed in this manner, the answer to the question of who is the discoverer of anesthesia is not a particularly difficult one to formulate. First, there is no single *discoverer*. And second, the *discoverers* are Wells *and* Morton; or, if you prefer, Morton and Wells. It makes little difference which name is placed first, so long as both are mentioned. I place Wells first largely because that is his correct chronologic location in relation to Morton.

Speaking of the men individually, I should designate Wells the "Father of Anesthesia," the man who started the train of events that brought anesthesia into being, and Morton the "Messenger of Anesthesia," the man who delivered the gift to the race. Other candidates may, for the most part, be classified as "Pioneers in Anesthesia"—a title which is rich in honor and, I fondly hope, not too provocative.

Speaking of pioneers reminds me to direct your attention to the fact that there is eternally a strange state of affairs existing in the records of the birth and growth of anesthesia. Whatever we naturally expect, we can almost invariably depend on it that the facts will be something else. For example, what could be more natural than to look to the past, to the graveyards, for pioneers? But that is not the only, or even the best, place to find them in the upside-down land of anesthesia. Genuine advancement in the science and art of anesthesiology was so slow in coming, and so recent in its arrival, that a high percentage of its most distinguished pioneers are still with us, still working for us. What is more—and to come to the point and purpose of mentioning the matter—not a few of these modern pioneers are here in Boston right now! I am sure Boston will permit me to speak for the city to the extent of saying that we want these pioneers to know that we are cordially aware of their presence, that we recognize and appreciate them.

Returning to the subject of naming the discoverers of anesthesia, I have already received the proposal that the name Crawford W. Long be added to those of Wells and Morton; and, from another source, the name Henry Hill Hickman has been proposed. Much as I admire Hickman and his work, and willing as I am to grant Long's priority over

both Wells and Morton, still I cannot accept either nomination. This decision was made not because I wish to reject these names—for wishes should play no part in such decisions—but because the facts and circumstances relating to the discovery do not permit me to include either of them. Neither man participated, either directly or indirectly, in any event which assisted in bringing anesthesia into existence. They were pioneers, but the title discoverer implies an identification with final success that neither achieved.[1, 3]

For those who insist on mentioning not less than three men, I suggest that they include another Bostonian, Charles T. Jackson, who at least played a part—a relatively small but nevertheless rather important role—in the introduction of anesthesia into practice. He at least fits into the background of the picture, and it is only because of a desire to simplify matters as much as possible that I omit him as one of the discoverers.

Since this is Morton's anniversary, we should, of course, take particular care to give him all credit possible; but not exactly all he asked, since he asked for more than was his. His greatest accomplishment—the introduction of surgical anesthesia into clinical practice—has already been granted. To this we may add, without much risk of going astray, two other items which are usually overlooked: He was first to demonstrate the successful use of an anesthetic agent in a major surgical procedure, and he was likewise first to suggest self-administered analgesia. Whatever that record may lack in length it makes up for in brilliance.

If, as I admitted at the outset of this discourse, I cannot be counted on to assist much in converting Morton into a standardized mythical hero, I can at least be depended on not to deny my indebtedness to him. One hundred years ago he introduced anesthesia into surgical practice. My cue, as a member of the human race and therefore one of the recipients of the blessings of anesthesia, is to acknowledge the gift with grateful thanks—which I do, reverently and without reservation.

And that concludes my struggle with the vexing question of who discovered anesthesia. My spirits, I admit, are not as high as they were at the outset. I am commencing to ask myself why I ever imagined I might make even a slight contribution toward settling an argument that has resisted settlement for a hundred years. I am remembering, with anxiety, that would-be peacemakers not infrequently succeed only in making more trouble. But I am remembering also that what is worth accomplishing is worth attempting, and that the desirability of settling the controversy is as great or greater than it ever was. To quote again from Welch's[2] excellent paper, ". . . it seems to me that every effort should be made to determine the share and the credit belonging to each contributor to the discovery and the introduction of surgical anesthesia, and to secure, so far as possible, an agreement of opinion in this important matter." With the world so torn with disagreement and strife as it is at present, it would be a gracious relief to find any group of individuals anywhere agreeing about anything.

Developments in Anesthesia

I offer no apology for having given so much time to a consideration of the controversy. It seems to me to be a matter of first importance. But I do regret that so little time remains to discuss the developments in anesthesia since that dramatic day in October, one hundred years ago, when William Morton proved, in his own disconcerting way, that relief from the awful pain of surgery was not an idle dream, not a false hope, but a sublimely merciful reality.

I offer no more than the merest

3. Raper, H. R.: A Review of the Crawford W. Long Centennial Anniversary Celebrations. *Bull. Hist. Med.* (March) 1943.

kaleidoscopic glimpse of the development of the science and art of anesthesia from its introduction up to the present time.

Inhalation Anesthesia.—The first exciting event after the introduction of ether anesthesia took place in England when, only three months after Morton's demonstration, Sir James Y. Simpson gave ether for childbirth; and, by so doing, brought the wrath of the clergy down on his head. And the second important development also came from England and from Simpson when, one year and one month after Morton's demonstration, he discovered chloroform anesthesia. These developments suggested that we might expect someone to discover a new anesthetic agent every few months but this was not to be true.

In the early 1860's, Prof. G. Q. Colton —the same professor whose show Horace Wells attended when he witnessed the incident of the battered shins—and several dentists revived the use of Wells's nitrous oxide gas and rolled up the impressive record of some 75,000 administrations for dental extractions. Then, in 1868, Edmund Andrews, a physician, mixed oxygen with nitrous oxide, and won acceptance of the mixture as an anesthetic for major surgical procedures.

When chloroform was first introduced and for many years thereafter, advocates of its use boldly declared that it was destined to replace ether; and, for a time, it seemed that this prediction might be fulfilled. But, as the years passed and knowledge about anesthesia grew, it finally became evident that chloroform could never replace either ether or nitrous oxide. Other challengers to this great pair of champions either won no more than a secondary place for themselves, as in the case of ethyl chloride, or were discarded completely, as in the case of acetylene.

Finding it not so easy to discover new anesthetic agents as had been supposed, investigators directed their energies toward improving the technic of administering those already in use. It was often difficult to get the patient through the stage of excitement at the beginning of anesthesia, and to get him out of anesthesia was comparable to a rough sea voyage. A method of lessening the period of excitement was finally achieved by giving the patient a dose of morphine about an hour before the fateful moment when the mask or cone was adjusted. This was definitely helpful, but it by no means eliminated the period of struggle to get the patient under anesthesia.

To put it bluntly, the art of anesthesia was not making rapid progress; and at the turn of the century and for some time thereafter, it appeared that a real rival of ether and nitrous oxide might never be found. In 1923, however, Luckhardt and Carter announced the discovery of ethylene gas anesthesia. At last, and at least, nitrous oxide had a competitor.

Academic research now began to pay dividends. Henderson and Lucas, in 1928, announced the discovery of cyclopropane, another gas anesthetic. In 1930-1931, Chauncey D. Leake introduced divinyl ether. Cyprome ether, developed in the laboratories of the University of Maryland, put in an appearance in 1939. Four new anesthetic agents, all good ones, two gases and two liquids, in seventeen years—all coming from university laboratories! A splendid record!

But I must not allow you to get the impression that common ether and nitrous oxide are outdated—for, definitely, they are not. One of the most striking things about the history of anesthesia is the enduring usefulness of these two excellent anesthetic agents.

Local Anesthesia.—Thus far we have considered inhalation anesthesia, only a part of the story. In 1884, Carl Koller reported his experiments with cocaine, and effective local anesthesia was born. In 1885, William S. Halsted developed nerve block technic with cocaine, and in the same year J. Leonard Corning did the first pioneering work in spinal anes-

thesia. Neither the nerve block technic nor spinal anesthesia began to win their present important position in the field of anesthesiology, however, until after the first effective cocaine substitute, procaine hydrochloride, was synthesized by the German chemist, Einhorn, in 1904.

Having had the temerity in the first part of this discourse to declare unequivocally that the medical profession and the world owes dentistry credit for discovering and introducing general anesthesia, may I now point out to dentists that it was physicians who gave us the kind of anesthesia that was needed. Wood and Pravaz, who developed the hollow needle hypodermic syringe; Koller, the father of local anesthesia; and Halsted, who developed nerve block technic: all were physicians. Appreciation should—and, as a matter of pleasant fact, does—mark the attitude of each profession for the other.

Balanced Anesthesia.—Returning to the theme of the development of anesthesia, we come now to such things as tribromethanol for rectal anesthesia, the barbiturates for intravenous anesthesia, and to the modern practice of "balanced anesthesia," a method of using two or more anesthetic agents instead of an overwhelming dose of any one. Balanced anesthesia had its earliest beginning when morphine was first administered to tranquilize the patient. The old, distressing spectacle of an anesthetist struggling, or even fighting, with a patient to get him to sleep is no longer necessary, since rectal or intravenous anesthesia eases him into unconsciousness without a period of excitement. The patient goes peacefully to sleep in his hospital room and wakes up again in the same room with no recollection of ever having been in an operating room or any place else.

The Anesthesiologist

We have the drugs, the paraphernalia and the technic today to meet almost any situation. The opportunity of achieving something closely approaching perfect anesthesia in the great majority of cases has never been so definitely within our grasp—nor have there ever been so many different ways of making mistakes as the multiplicity of drugs and methods now affords. What we need is more specially trained operators to take better advantage of the opportunities at hand, and we are making progress in this direction. Facilities for teaching anesthesiology are improving and there are more and better graduates in the specialty coming along each year.

Speaking for myself as a potential surgical patient, I would choose my anesthetist with as much care as I would exercise in the selection of my surgeon. Nothing could be much further from the truth than the old idea that no special qualifications or training are needed to administer anesthetic agents. Nothing reveals a more abysmal ignorance of the facts than the old wisecrack, which was popular when I went to college, to the general effect that all an anesthetist needed to be was lazy, since all he had to do was just sit there and sprinkle a little more ether on the cone now and then. No specialty of medicine is more challenging; none requires greater ingenuity, skill and knowledge; and certainly none offers greater opportunity for giving needed service than the practice of anesthesiology.

Painless surgery came a hundred years ago, and now safer, more effective anesthesia is at hand. The phrase "painless surgery" reminds me that George Bernard Shaw recently remarked that there is no such thing, that it is "a thundering lie" and means only that "the patient does not feel the touch of the surgeon's knife." I see what Mr. Shaw has in mind, and I am not disposed to contradict him. Plenty of pain does indeed come after operations, and it often seems to me that we give it too little consideration. But even here there is promise of improvement. For the first time since the discov-

ery of morphine over a century ago, it at last has, if not a rival, at least a worthy ally, in the new drug meperidine (Demerol*).

However, it is not wise to pin one's faith in drugs alone. There is more to the relief and control of pain than the administration of narcotic and anesthetic drugs. Muscle-relaxing drugs, for example, may give more relief in certain cases than anodynes. Here is where the specialist in anesthesia is invaluable. He is an expert in the control of pain. His medical colleagues should make greater use of his special knowledge and consult him not only for the control of postoperative pain but also in a great variety of cases for any kind of pain in any kind of patient, whenever it becomes a major factor in treatment.

Nobody is likely to thank me for that suggestion. It will irritate the surgeon and get the anesthesiologist into trouble. Nevertheless, I make it for the sake of patients. If I seem to imply that surgeons lack the capacity or impulse to relieve the pain that follows surgery, I have gone further than I intended. All I am saying is that we have specialists in the control of pain and we should use them more than we do. After all, surgeons are surgeons, and anesthesiologists are anesthesiologists. We need both.

Mark Twain, by the way, once spoke of his dentist as having "the calm, possessed, surgical look of a man who could endure pain in another person." An anesthetist should have the look of a man unable to endure pain anywhere.

Because I have shown such admiration and respect for anesthesiologists, I should perhaps explain that I am not an extremist. The pendulum swings fast and far in America; and, from the notion that just anybody could administer an anesthetic agent, some persons have progressed to an opposite extreme. I cannot agree with those who seem to think that nobody except a diplomate in anesthesiology ever, under any circumstances, should be allowed to administer an anesthetic; and I cling doggedly to the old-fashioned method of judging men and women by their work, not by their diplomas, certificates or licenses. Thus far, anesthesiologists have won their position of pre-eminence by virtue of their record of service and achievement. May they hold it in the same hard way, with no more help and special privilege than may be necessary to insure continued development; and never enough to bring on what Henry Sigerist, speaking of conditions in Europe, describes as a "stifling self-satisfaction and fossilizing feeling of superiority."

*Demerol is the exclusive trade-mark of the Winthrop Chemical Company, Inc., New York.

A New Specialty

New drugs, new methods, new appliances, new technics, a new specialty in medicine! All these things have developed in the field of anesthesiology during the last century; most of them have come during the last twenty-five years. We should be and we are grateful. We try to show our gratitude for both the birth and growth of anesthesia by celebrations such as this one. And we are justly proud of what has been, and is being, accomplished. But before pride runs away with us, let me offer this sobering thought: It is impossible for the science and art of relieving pain to keep pace with our awful proficiency at inflicting it. Consider the atomic bomb! Most people think of it as something that kills instantly, almost mercifully. But how about those who are not killed, not killed at once? How can the art of relieving pain, based as it must be on individual administration, keep up with a method which injures thousands at one stroke? Marvelous as it is, more marvelous as it may become, anesthesiology is helpless against such odds. We look back with horror at the wars of other days when there were no anesthetics to protect the wounded. But if we look forward to

atomic war we see something so much more horrible it paralyzes the emotions. Man must use his scientific discoveries for the benefit of mankind or face a future worse than anything he has ever known.

In closing, may I, with all the sincerity at my command, congratulate the city of Boston, not so much on being the site of the demonstration that introduced anesthesia to the world as on the custom, which you have followed for a hundred years now, of repeatedly celebrating the event. It is a basic fault of human nature to take our blessings for granted, and it is to the everlasting credit of Boston that you have not fallen into that callous error. It has, I assure you, been an unexpected and deeply appreciated honor to be allowed to participate in the present centenary celebrations.—*1516 East Silver Avenue.*

WILLIAM T. G. MORTON AT THE MASSACHUSETTS GENERAL HOSPITAL

Kurt H. Thoma,* D.M.D., Boston

THE dental service at the Massachusetts General Hospital, begun in 1868, has constantly grown until today there are thirty-eight members on the staff. The cooperation between the various departments is one of the outstanding features of the institution, which is well known for its traditions and great accomplishments. However, long before the dental department was inaugurated, dentists played an important role in the history of the hospital. The most outstanding of these was William Thomas Green Morton who, on October 16, 1846, gave the first public demonstration of the use of ether as an anesthetic.

Robert T. Davis, one of the surviving witnesses of this memorable event, gave the following description of the demonstration in a paper read at the Semi-Centennial, October 16, 1896:

The operation in which the anesthetic was administered was performed in the surgical amphitheatre of the Massachusetts General Hospital by Dr. John C. Warren, in the presence of a number of distinguished surgeons and physicians, including Dr. Hayward, the elder Dr. Bigelow, one of the wisest and greatest men who have adorned our profession with their multifarious gifts and accomplishments, and his celebrated son, not then arrived at the zenith of his fame. The Harvard medical class was also present. After some delay, Dr. William Morton appeared with his apparatus, when Dr. Warren addressed the medical class, which had not been previously notified of the proposed experiment, stating in substance that there was a gentleman present who claimed that he had discovered that the inhalation of a certain agent would produce insensibility to pain during surgical operations with safety to the patient, and he added that the class was aware that he had always regarded that condition as an important desideratum in operative surgery, and he had decided to permit him to try the experiment.

The patient, who was a young man, was suffering from a vascular tumor of the neck on the left side, occupying the space from the edge of the jaw downward to the larynx and from the angle of the jaw to the median line. Dr. Morton proceeded to apply to the lips of the patient a tube connected with a glass

*Chairman of the William T. G. Morton Centennial Committee of the American Dental Association; oral surgeon and chief of the Dental Department of the Massachusetts General Hospital.

globe. After the inhalation had continued four or five minutes he appeared to be asleep, and the operation was commenced and completed without further inhalation of the ether. It consisted of an incision about three inches in length over the center of the tumor, and through the skin and subcutaneous cellular tissue, and the removal of a layer of fascia, which covered the enlarged blood-vessels. A curved needle armed with a ligature was then passed under and around the tumor, and considerable compression was employed.

During most of the time occupied by the operation the patient gave no sign of sensibility, and appeared to be sleeping quietly. A short time before its completion he moved his head, body, and limbs, and muttered words which I could not hear distinctly, but upon recovering consciousness he declared that he had suffered no pain, but simply a sensation like scraping the parts with a blunt instrument.

The exhibition of the anesthetic was admitted by those present to be a complete success. The operating surgeon expressed his satisfaction in these emphatic words: "Gentlemen, this is no humbug." From that time forward it became the practice to employ it at the hospital in all operations of importance.

Dr. Morton continued to administer it until it was proved that it could be easily and safely administered by others. The apparatus which he had used in the first and a few subsequent instances was soon abandoned as unnecessary and attended with possible risk, and a concave sponge was substituted. Sulfuric ether as an anesthesia very promptly passed into general use in Boston and throughout the state, and soon afterward in public and private practice in the large cities of other states, followed by its employment all over the country wherever scientific surgery was practiced. Its fame crossed the ocean, and it rapidly became a necessary adjunct to surgery in Europe as well as here, and beyond, even to the utmost limits of civilization; it did not stop there, but among savage tribes and barbarous races in distant continents and islands it followed the footsteps of the explorer, the trader, and the missionary on its divine errand of mercy to mankind.

It was impossible to comprehend the importance of this discovery. Fifty years ago, Davis said: "It is a matchless discovery, destined to bestow blessings, so long as the race shall endure, wherever in all time human suffering cries aloud for succor or languishes in silent despair, and the divine attribute of mercy, aided by the wisdom of science, flies to its relief."

One Hundredth Anniversary

One hundred years after this great event we realize better still the importance of these words. The method, which had been originally developed by Morton "to relieve pain during operations upon the teeth," as Warren had put it, and which was found by Warren to allow surgical procedures to be carried out painlessly, has given rise to research in a new field out of which new methods of anesthesia have been developed. Today surgical and diagnostic procedures can be carried out on the conscious or unconscious patient without hurry, without strain and with great deliberation. Thus, Morton's discovery has not only removed the dread of surgery, the agony of anticipation, and the delay until life became unbearable and the disease inoperable, but it has also made possible undreamed of advances and refinement in surgical technic.

This year we have celebrated the one hundredth anniversary of the introduction of anesthesia into surgery. As we read about the latest methods for the relief of pain and the progress which was made possible by anesthesia in medicine and dentistry, let us not forget the man who had the courage to make the first demonstration. The gift which he gave to mankind is well expressed in a poem by S. Weir Mitchell,[1] of Philadelphia. The following verses speak for themselves:

1. Mitchell, S. W., *The Birth and Death of Pain: A Poem Read October 16, 1896, at the Commemoration of the Fiftieth Anniversary of the First Public Demonstration of Surgical Anaesthesia.* New York: Vreeland Advertising Press, 1896.

What Angel bore the Christ-like gift inspired!
What love divine with noblest courage fired
One eager soul that paid in bitter tears
For the glad helping of unnumbered fears,
From the strange record of creation tore
The sentence sad each sorrowing mother bore,
Struck from the roll of pangs one awful sum,
Made pain a dream, and suffering gently dumb!

How did we thank him? Ah! no joy-bells rang,
No paeans greeted, and no poet sang,
No cannon thundered from the guarded strand
This mighty victory to a grateful land!
We took the gift, so humbly, simply given,
And coldly selfish—left our debt to Heaven.
How shall we thank him? Hush! A gladder hour
Has struck for him; a wiser, juster power.

Whatever triumphs still shall hold the mind,
Whatever gift shall yet enrich mankind,
Ah! no hour shall strike through all the years,
No hour as sweet, as when hope, doubt, and fears,
'Mid deepening stillness, watched one eager brain,
With God-like will, decree the Death of Pain.

THE PIONEERS OF SURGICAL ANESTHESIA: A TRIBUTE

Arthur H. Merritt, D.D.S., M.S., Sc.D., New York

THE year of 1846 marks the beginning of a new era in human history, for in that year the dream of centuries became a reality. For more than 3,000 years men had striven to find some anodyne—some dreamed of nepenthe—that would afford surcease from pain in surgery. Aesculapius and Hippocrates, among others in their day, had shared in these dreams. Potions brewed from herbs, the vapors of bhang, mandrake, opium, alcohol, had one by one been pressed into service in the hope that the looked for anodyne had been found, and one by one they had failed.

Undiscouraged, succeeding generations carried on the search—Mesmer, Davy, Hickman, Collier and others in Europe. To them were given glimpses of the promised land, but fate denied them entrance. Still the quest went on and still it failed. And as so often happens in life, it was to be given to others to reap where these had sown.

And so it was that in that western world of which those earlier pioneers

had never dreamed, the way to painless surgery was finally to be made clear—not in a day nor in all its beneficence, but step by step over a period of years. Just as "the kingdom of heaven cometh not with observation," so it was to be with anesthesia, and so it is with all great discoveries.

Nor was it to be given to one individual, alone and unaided, to make the goal. Others were to share in the distinction. Perhaps the honor of being the discoverer of anesthesia was too great to be borne by one individual and therefore was to be shared by all who in their generation had visions of painless surgery. For if it be true that "it's not what man does exalts him, it's what man would do," then these others who strove toward the mark for the prize must be awarded their share of commendation. Their toil was not in vain.

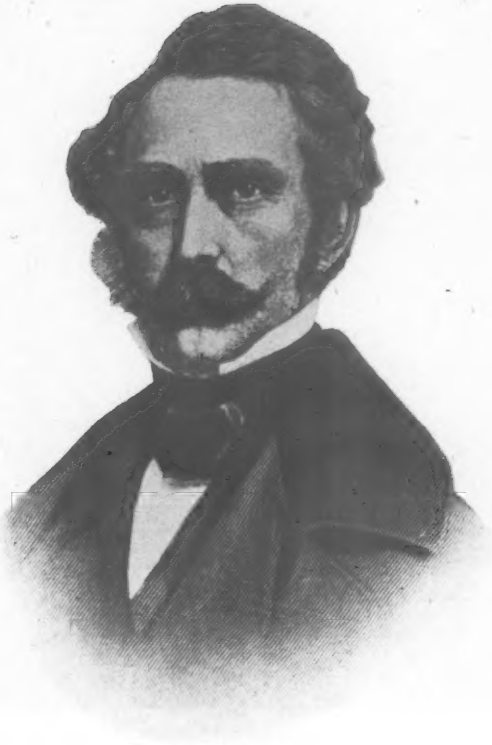
In this anniversary year of 1946, as tribute is being paid to the memory of one of those who collectively gave anesthesia to the world, let it not be forgotten that others blazed the trail and made easier the pathway to success. The honor of having had a part in advancing the knowledge of anesthesia is great enough to be shared by all.

Building on the foundation laid by others, Morton proved by his demonstration at the Massachusetts General Hospital on October 16, 1846, the possibilities of ether anesthesia and brought to fulfillment the dream of the centuries. It was he who had the courage to put his vision to the test—to face ridicule, controversy and suspicion.

Not often is it given to an individual to become a world benefactor—to be the bearer of gifts so great as to touch directly or indirectly the health and well-being of millions of people throughout the world; yet that is true of Morton. No greater blessing was ever bestowed upon mankind than the power to induce temporary but complete insensibility to surgical pain. This was Morton's gift to humanity. Well may the world bow in reverence at the mention of his name—a name to be revered throughout all generations.

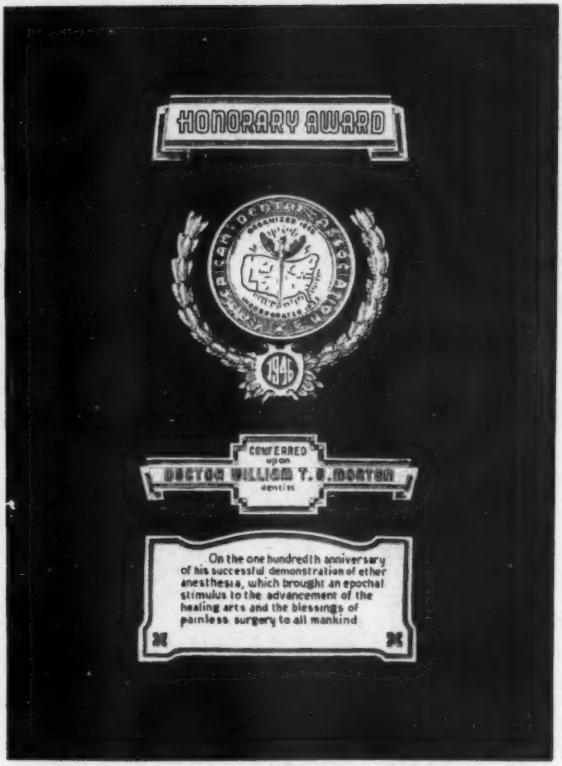
In the tribute now being paid to his memory, let there be no room for rivalry —no place for controversy. Let there be instead rejoicing at the priceless gift of anesthesia. "In the great temple of human lives, what matter who puts on the copestone and the gleaming pinnacle? What matter who does the work and gets the credit so the work is done?" What higher service can be wrought by human hands than that rendered by these centuries and centuries of workers who foresaw the need of anesthesia and gave the best that was in them in an endeavor to assuage human suffering. To them—the seekers after painless surgery in all ages—let the world pay tribute as in this year of 1946 it celebrates the anniversary of one whose name must always stand high in the annals of anesthesia, William T. G. Morton.—*580 Fifth Avenue.*

W. T. G. MORTON CENTENNIAL CELEBRATION



W. T. G. Morton

A PORTFOLIO OF HISTORICAL PICTURES



Honorary Award of the American Dental Association conferred on William T. G. Morton on the first centennial of his epochal demonstration. The presentation ceremony was held during the annual meeting of the House of Delegates, Miami, October 15, 1946

Farmhouse in Charlton, Mass. (above), which was the birthplace of Dr. Morton on August 9, 1819. Below, a monument to the memory of Dr. Morton in Charlton, erected by the dentists of America

DR. H. J. BIGELOW
DR. A. A. GOULD
DR. J. C. WARREN
DR. W. T. G. MORTON
DR. SAMUEL PARKMAN
DR. GEORGE HAYWARD
DR. J. MASON WARREN
DR. S. D. TOWNSEND
The First Public Demonstration of Surgical Anaesthesia
Boston, October 16 1846

A painting (above) picturing the first public demonstration of ether anesthesia. Below, Ether Dome, Bulfinch Building, Massachusetts General Hospital, with an inscription commemorating the demonstration and two cabinets containing historical material relating to the event. On right hand page, two more visualizations of the historic event

ON OCTOBER 16, 1846 IN THIS ROOM THEN THE OPERATING THEATRE OF THE HOSPITAL
WAS GIVEN THE FIRST PUBLIC DEMONSTRATION OF ANAESTHESIA
TO THE EXTENT OF PRODUCING INSENSIBILITY TO PAIN DURING A SERIOUS SURGICAL OPERATION
SULPHURIC ETHER WAS ADMINISTERED BY WILLIAM THOMAS GREEN MORTON A BOSTON DENTIST
THE PATIENT WAS GILBERT ABBOTT THE OPERATION WAS THE REMOVAL OF A TUMOR UNDER THE JAW
THE SURGEON WAS JOHN COLLINS WARREN
THE PATIENT DECLARED THAT HE HAD FELT NO PAIN DURING THE OPERATION
HE WAS DISCHARGED WELL DECEMBER 7
KNOWLEDGE OF THIS DISCOVERY SPREAD FROM THIS ROOM THROUGHOUT THE CIVILIZED WORLD
AND A NEW ERA FOR SURGERY BEGAN

WILLIAM T. G. MORTON, DENTIST, WHO FIRST PUBLICLY DEMONSTRATED ETHER ANESTHESIA: A SHORT BIOGRAPHY

W. Harry Archer,* D.D.S., B.S., Pittsburgh

William Thomas Green Morton was born on a farm near Charlton, Mass., August 9, 1819.

Education

His education was started in a small country school where the quality of teaching was exceptionally poor. His father, formerly a Quaker from the Society of Friends in Smithfield, was determined that his son was to have a better education than was afforded in the country school, and so he moved his family into the village of Charlton where there was a small academy.

Morton, now 8 years old, was enrolled in the Charlton Academy. This school, too, was thought by his father to be inadequate, and so, in the next nine years, Morton went in succession to the Oxford Academy, the Northfield Academy and the Leicester Academy.

Morton had long cherished the idea of studying medicine, but, when he reached the age of 17, his father's financial condition made it imperative that he give up this idea, at least for the time being. He secured a position in a book store in Boston, but in a short time he was back home working with his father. For the next four years he led a rather hectic career in the mercantile business, a venture which finally ended in disaster for him and his partners.

In 1840 he went to Baltimore. It is probably because of this stay in Baltimore that it has been reported that he studied dentistry in the Baltimore College of Dental Surgery. According to Dean J. Ben Robinson, Morton was never enrolled in that school.

In 1841, Morton took up the study of dentistry, on a part-time basis, with Horace Wells, in Hartford, Conn., as is evidenced by the following notation in Horace Wells's day book: "Dr. Wm. T. G. Morton to operation on teeth and instructions in the art of dentistry, as per agreement—$50.00."

Early Practice

Morton's salesmanship is demonstrated by the fact that, in October 1843, he persuaded Horace Wells to open an office in Boston for the joint practice of dentistry. Wells had invented a new solder, and Morton thought that Boston was the place to introduce it, as the following advertisement indicates:

DENTISTS

Messrs. Wells & Morton, Dentists, No. 19 Tremont Row, are determined to make their valuable invention extensively known, and duly appreciated in the shortest time possible; with this in view we now propose to insert teeth on gold (until further notice) without compensation until the expiration of one year; then, if the patient is perfectly satisfied that our invention is really valuable and superior to any other mode of constructing gold plates,

*Professor of oral surgery and anesthesia, School of Dentistry, University of Pittsburgh.

we shall expect a small compensation, which may be previously agreed upon, otherwise we will ask nothing. All we shall require, when the teeth are inserted, will be just enough to pay for the materials used, which will be but a trifle. If, by this means, we are enabled to introduce our improvement more extensively than in the ordinary way, our object will be attained.

All persons can have the benefit of this proposition, whether living at a distance or in town, by calling or sending us word within one week after the publishment of this notice, so long as it may be continued.

N. B.—Dr. Charles T. Jackson's certificate respecting this invention to be seen at our office.

Wells & Morton
No. 19 Tremont Row.

A month later, Wells withdrew from this partnership. Morton continued his dental studies, as time permitted, with one of Boston's outstanding dentists, N. C. Keep, then vice-president of the American Society of Dental Surgeons, and later to be one of the founders of the Harvard School of Dentistry. Keep described Morton at that time as "a very enterprising dentist—his mind ever active and seeking for improvement."

In March 1844, Morton began to study with Charles T. Jackson, noted physician, chemist and geologist of Boston. This eccentric gentleman took a liking to Morton and invited him to live at his home.

Morton's practice grew rapidly and on May 29, 1844, he traveled back to Farmington to marry Elizabeth Whitman. Among those present at the marriage, in the bride's home, was his former teacher and partner, Horace Wells.

In November 1845, Morton matriculated at the Medical School of Harvard University. Since classes were held in the evenings, Morton was able to continue his ever increasing dental practice during the day.

In January 1845, Morton received a letter from Wells, asking him to arrange for a public demonstration of the use of nitrous oxide to relieve the pain of teeth extractions. When Wells arrived in Boston, Morton presented him to John C. Warren, professor of anatomy and surgery, Medical School, Harvard University, and arrangements were made for Wells to speak on "the use of nitrous oxide for the prevention of pain," and to demonstrate this agent on a patient before the medical students. The story of this unsuccessful demonstration is well known, but what is not commonly recognized is that this experience was responsible for Morton's interest in the problem of relieving pain.

Although Morton was busy with his practice and medical studies, he also gave instruction in dentistry, as is shown by this advertisement which appeared in the *Boston Medical & Surgical Journal*, 1846.

INSTRUCTIONS IN DENTISTRY

Dr. Morton being provided with an extensive Dental Library, embracing works of value, which have appeared in this country and abroad, and with a cabinet of healthy and morbid preparations, is prepared to give practical instructions in theoretical and practical dentistry, to such as may avail themselves of the advantages offered by him, during the lecture season, preparatory to entering college. Opportunities will be afforded to students to witness and perform operations connected with surgical and mechanical dentistry. Terms made known on application.

Demonstration of Ether Anesthesia

In 1846, Morton met a Miss Elizabeth Williams, who, on learning that he was a dentist, told him of her wonderful painless experience of having a tooth extracted by Wells while she was under the influence of nitrous oxide. Once more Morton's thoughts turned toward a method of relieving pain. He arranged a trip to Hartford to see Wells and to discuss Wells's use of nitrous oxide. Wells referred Morton to Jackson, his preceptor in chemistry, for consultation regarding the manufacture of

nitrous oxide. Jackson warned Morton of the dangers in the use of nitrous oxide, as he had previously warned Wells, and suggested the use of ether instead.

After some crude preliminary experimental work, Morton was ready to try ether on a patient. On September 30, 1846, a Mr. Eben Frost came trembling into Morton's office, with an acute toothache. What subsequently took place is described by Morton as follows:

> Towards evening a man residing in Boston came in, suffering great pain, and wished to have a tooth extracted. He was afraid of the operation, and asked if he could be mesmerized. I told him I had something better, and saturating my handkerchief, gave it to him to inhale. He became unconscious almost immediately. It was dark and Dr. Hayden held the lamp while I extracted a firmly-rooted bicuspid tooth. There was not much alteration in the pulse and no relaxing of the muscles. He recovered in a minute and knew nothing of what had been done for him. We remained for some time talking about the experiment. This was the 30th of September, 1846.

In other words, Morton's first experiment with ether anesthesia took place approximately two years after Wells had first discovered, demonstrated and proclaimed the blessings of surgical anesthesia.

The next day in the *Boston Journal* the following news item appeared:

> We would call attention of our readers to the advertisement of W. T. G. Morton, a Dentist, 19 Tremont Row. This gentleman has been successful in his practice, in this city. Last evening as we were informed, by a gentleman who witnessed the operation, an ulcerated tooth was extracted from the mouth of an individual, without giving him the slightest pain. He was put into a kind of sleep, by inhaling a preparation, the effects of which lasted for about three quarters of a minute, just long enough to extract the tooth. The gentleman, who detected the principal ingredient of the preparation, by the odor, states that the use of it is entirely free from danger.

Morton then sought an opportunity for the public demonstration of the practicability of anesthesia. This was furnished him in the surgical amphitheater of the Massachusetts General Hospital, on October 16, 1846. The Harvard medical class was present, as well as several prominent surgeons and physicians. The surgeon in charge was Warren, to whom great credit is due for giving Wells and Morton the opportunity to demonstrate publicly their anesthetic agents. The operation was the removal of a tumor from the left side of the neck of a young man who was described in the records as "Gilbert Abbott, aged twenty, single, painter." The exhibition of the anesthetic was such a complete success that Dr. Warren turned to those present and said, "Gentlemen, this is no humbug."

The ether was administered with a modified hollow glass ball. A sponge inside the ball was saturated with ether; the nostrils were closed with one hand, and the mouth piece placed between the patient's lips; the patient breathed through his mouth, and the incoming air, passing over the ether saturated sponge, became charged with ether vapor.

The *Boston Daily Advertiser,* November 4, 1846, carried the following advertisement:

> TEETH EXTRACTED WITHOUT PAIN
>
> For years, surgeons and dentists have vainly sought for some means to alleviate pain, while severe operations were taking place. Many an individual has gone to his grave, through a dread of suffering, who might have been saved, had he been willing to place himself in the hands of the surgeon; and persons have suffered for many a long year with their teeth, rather than submit to have them extracted. It is acknowledged that extracting teeth is one of the most painful operations in surgery, but the pain being momentary, is not so generally perceived. To remove all these difficulties, and allow even the most sensitive an opportunity for the performance of any surgical or dental operation, Dr. Morton has discovered a compound to alleviate pain. He

can after administering it, extract a tooth, and the patient will not be sensible of the slightest pain. He has done it in repeated instances. He has made arrangements to extract teeth, using his compound, at his Rooms, No. 19 Tremont Row.

Conflicting Claims

The fame of the wonderful new agent and of its discoverer spread rapidly. Then Jackson, jealous of the fame of Morton and anxious to participate in the benefits of the discovery, made a claim as to his rights in the discovery. He had suggested the drug to Morton, and he claimed that he had advised Morton about its nature and about the best methods of its administration. To silence Jackson, Morton entered into a secret agreement with him which was soon broken. The agreement stated that Morton was to patent the secret compound, now called Letheon, and to pay a percentage of the royalties from the use of the Letheon to Jackson.

The *Boston Daily Transcript,* November 20, 1846, carried the following notice:

To the Public, Dr. Morton, Surgeon Dentist, No. 19 Tremont Street, Boston, hereby gives public notice that Letters Patent have been granted by the government of the United States, for his improvement, whereby pain may be prevented in dentistical and surgical operations. He is now making arrangements to allow dentists, surgeons, and other suitable persons, to purchase license to use said improvement, and all persons are hereby cautioned against making any infringement on the same, if they would avoid the trouble and expense of prosecution and damages at law.

The New York Commercial Advertiser, The Philadelphia U. S. Gazette, The Baltimore American, New Orleans Picayune, Courant, Hartford, Ct., Herald, Norfolk, Va., Patriot, Charleston, S. C., Courier, Louisville, Ky., Reveille, St. Louis, Mo., are requested to copy and send the bills to the office.

A controversy now arose between Wells, Jackson and Morton, and later Long, for the title of discoverer of anesthesia. Morton refused to concede priority to Wells, claiming that nitrous oxide was not an anesthetic. Jackson, the wealthiest of the claimants, published pamphlets for many years, setting forth his claims.

First Specialist in Anesthesia

Morton gave up the practice of dentistry and devoted all of his time to anesthesia. He was the first specialist in the administration of anesthetics, the first manufacturer of anesthetic equipment and the first teacher of anesthesia. He trained young men in the art of anesthesia, and sent them to various parts of the country to instruct persons who had purchased licenses to administer the anesthetic.

Demands on his time were so great that he trained assistants to administer anesthetics, as is explained in the following notice which appeared in the *Boston Medical & Surgical Journal* for November 1846:

TO SURGEONS AND PHYSICIANS

The subscriber is prepared to furnish a person fully competent to administer his compound to patients who are to have surgical operations performed, and when it is desired by the Operator that the patient should be rendered insensible to pain. Personal or written application may be made to

W. T. G. Morton, Dentist

No. 19 Tremont Row, Boston

P. S. Surgeons and Physicians who may wish to witness the effect of this new agent, are respectfully invited to call at my room. In the next No. of the Journal, a name for the new operation will be given.

Morton was indeed a busy man. In the midst of his expanding activities with relation to the introduction of ether anesthesia here and abroad, he was obliged to fight against a surprisingly large amount of opposition to the use of anesthesia. In this battle he was materially aided by the surgeons of the Massachusetts General Hospital. Sad to relate is the violent opposition that was

repeatedly voiced in the daily press by his fellow dentists of Boston, led by J. F. Flagg.

Whatever else may be said about Morton, no one can deny that he had boundless energy and courage. His perseverance and tenacity in subjecting himself to the opposition, personal slander, ridicule, indignities to his family and privation which resulted from his introduction of anesthesia and his attempts to establish his right to be called the discoverer of anesthesia are truly remarkable.

Morton impoverished himself in his attempts to establish the validity of his claims as the discoverer of anesthesia. After having sold everything he had, he was finally compelled to pledge as collateral his dental instruments and his library, and he was even required to include the gold medal which he had received from the French Academy. He died July 15, 1868, practically penniless.

Although Morton cannot be called the discoverer of anesthesia, he certainly introduced anesthesia as a practical procedure, and is entitled to all the honor which has been bestowed upon him.—*804 Professional Building.*

LOCAL ANESTHESIA IN ORAL SURGERY

Maurice J. Hickey,* D.M.D., M.D., New York

THE production of anesthesia in a limited area and without loss of consciousness has been the goal of investigators for several centuries. The invention of the hypodermic syringe in 1845 and the discovery of cocaine in 1879 can be said to mark the beginning of local anesthesia as we know it today. The use of cocaine as the anesthetic agent soon proved to be unsatisfactory. The drug was dangerously toxic when injected, and the duration of the anesthesia was short. The disadvantages of cocaine were somewhat lessened with the discovery of epinephrine. The addition of epinephrine to the solution reduced the toxicity and prolonged the anesthesia by delaying the absorption. Yet cocaine remained, as it is today, a dangerous drug to inject.

The search for a safer anesthetic agent continued, and in 1905 procaine, a synthetic drug, was discovered. Since then tremendous strides have been made in the field of local anesthesia. Technics have been mastered, and the search for even safer and better anesthetic agents has continued. Today it would be difficult to imagine a situation within the oral cavity that would not permit the control of surgical pain by means of local anesthesia. True, there may be occasions when it is better judgment to choose a general anesthetic for oral surgery, but this selection can rarely be based solely on the inability to produce safe local anesthesia.

The oral surgeon is in a position of great advantage in the administration of a local anesthetic. He has only one nerve with which to deal. Furthermore, nature has seen fit to arrange the anatomy of this nerve in such an ideal way that the

This paper was read at the Morton Centenary Celebration of the Massachusetts Dental Society, Boston, October 15, 1946.

*From the School of Dental and Oral Surgery, Columbia University.

surgeon has a wide choice of locations for depositing the anesthetic agent. The great majority of oral operations can be performed after anesthetizing either the second or third divisions of the fifth cranial nerve.

Methods of Administration

The methods of administering local anesthesia fall into two main groups: (1) the nerve block in which all of the distribution of the nerve fibers peripherally to the point of injection is anesthetized and (2) infiltration of the operative area. In the latter method of administration, anesthesia is limited to an area bounded by a periphery that represents the furthest diffusion of the anesthetic solution through the tissue. The choice of the method depends on many factors, but a safe general rule to follow is to use the simplest method that will achieve the desired result. This decision is based on such factors as the extent of the area to be operated upon, the ease with which the injection can be given and the presence or absence of infection. Infection alone should rarely be the deciding factor, since there are few occasions when infection will prevent obtaining local anesthesia in a given area. Choice of sites of injection makes this possible.

Nerve Block

Anesthesia of the maxilla, including the maxillary sinuses, can be obtained by second division nerve block. The extent of this anesthesia can be regulated by the choice of the area in which the injection is made. If the surgical requirements are such that a large part or all of the maxilla should be anesthetized, then the second division can be blocked as it crosses the sphenomaxillary space. The technic for this injection is no more difficult than for the mandibular block. It requires no special equipment, although a right angle needle does simplify the technic. Three approaches are available: intra-oral, extra-oral and orbital. The last method is more dangerous and is rarely used.

The intra-oral route is probably the simplest and safest approach. The operator stands in front of the patient with the patient's head thrown well back. The cheek is retracted, and the mucous membrane is punctured at the highest point in the mucobuccal fold. This will be above, and buccal to, the apices of the roots of the upper third molar. The needle is advanced upward, inward and slightly backward until the periosteum covering the posterolateral surface of the maxillary tuberosity is reached. The needle is then advanced in close contact with this periosteum until a total depth of 3 cm. is reached. Four cubic centimeters of a 2 per cent solution of procaine is deposited. This injection will produce complete anesthesia of the half of the maxilla innervated by the nerve injected. However, if the operative field approaches the mid-line, the anesthesia will be incomplete owing to the overlapping fibers from the opposite nerve. Infiltration or nerve block anesthesia should be used to anesthetize these crossing fibers.

The extra-oral route for blocking the second division as it passes through the sphenomaxillary space is somewhat more difficult but at times is a valuable approach. To locate the site of injection, the anterior margin of the coronoid process is palpated and marked with a line. The lower border of the malar bone is palpated and marked with a line that joins the upper end of the first mark. The distal ends of these two lines are joined to form a triangle, and the center of this triangle marks the site of injection. A 6 cm. 20 gage needle is used and is made to pass inward, upward and backward at an angle of 40 degrees from the horizontal line. When the needle has entered about 2½ cm., it should be worked back and forth while the syringe is moved laterally. This is to identify the

posterolateral surface of the tuberosity. Then the needle is inserted into the sphenomaxillary fossa to a total depth of 5 cm., and 4 cc. of a 2 per cent solution of procaine is injected.

Of these two methods, the intra-oral approach has several definite advantages: (1) the distance from puncture point to nerve is shorter; (2) the needle passes anteriorly and laterally to the internal maxillary artery; (3) the injection is more comfortable for the patient; (4) the technic is simpler and the results are more certain.

The technic of blocking the second division should be mastered by every oral surgeon. Severe fractures of the maxilla in which use of a general anesthetic might be dangerous can be reduced with the anesthesia of a second division block. In surgical operations of the maxillary sinus, which always pose an anesthesia problem if the simpler technics are used, an intra-oral block of the second division will provide excellent anesthesia.

Four other routes for partial blocking of the second division are available: (1) injection of the posterior superior alveolar nerve for anesthesia of the upper second and third molar area; (2) injection of the anterior palatine nerve for anesthesia of the palate; (3) injection of the nasopalatine nerve for anesthesia of the anterior surface of the palate (the last two injections must frequently be given together to achieve complete anesthesia); (4) injection of the infra-orbital nerve at its exit from the infra-orbital foramen. This will provide partial anesthesia of the upper lip and the region of the three anterior teeth on that side. For complete anesthesia of this area, the injection must be bilateral or supplemented with infiltration anesthesia to anesthetize the fibers crossing from the opposite side and from the middle superior alveolar nerve on the same side.

The extra-oral technic for injection of the infra-orbital nerve is not difficult and should be mastered. This injection is accomplished by inserting the needle 1 cm. below the orbital margin in a line with the upper cuspid tooth. A few drops of procaine are deposited, and the needle is moved around gently until the infra-orbital foramen is located and 2 to 4 cc. of a 2 per cent solution of procaine is injected.

The third division of the fifth nerve, because of its anatomic location in the depths of a bone covered by a dense cortex, usually requires block injection to produce satisfactory anesthesia. The intra-oral technic for blocking the mandibular nerve and its lingual branch is too familiar to require further elaboration. When local anesthesia is desirable and trismus or infection makes the intra-oral technic difficult or dangerous, satisfactory anesthesia can be obtained by the extra-oral route. Two methods for this injection are available. One is through the sigmoid notch to reach the nerve near the oval foramen. The other is from the region of the angle of the mandible to reach the nerve at its entrance into the mandibular foramen. This latter method is safer and simpler. The point of injection is located by drawing a line from the tip of the coronoid process to the point of the angle of the mandible. The skin overlying the angle is then drawn upward and forward until it is taut. The needle is inserted behind the point of the angle and passes upward and forward in the direction of the line drawn on the skin. The needle is inserted to a depth of about 4 cm. and the solution is deposited.

Infiltration

In many oral surgical procedures, the extensive anesthesia produced by the nerve block method is undesirable or unnecessary. In many cases, excellent anesthesia can be obtained by infiltration of the area to be operated upon.

The term infiltration anesthesia is one that is generally accepted. Terminal or peripheral anesthesia would be a more accurate anatomic term. The use of infiltration anesthesia is limited to tissue through which the injected solution will readily diffuse. If the nerve endings that are to be anesthetized are buried deeply in bone, infiltration anesthesia is likely to fail.

Many methods of administering infiltration anesthesia are available. All have their use in selected cases, but the technic in some is more difficult than using block anesthesia to accomplish the same result.

The most commonly used method and the simplest is the submucous. In this injection the solution is deposited between the mucous membrane and the periosteum. This method has the advantage of being relatively painless during the time that the solution is being introduced. Quite large areas can be infiltrated with only one needle puncture by moving the needle along through the area to be anesthetized. The chief disadvantage is the distortion of the tissue by the volume of solution injected and the resistance to the diffusion of the solution created by the barrier of periosteum. This latter fact is no real disadvantage other than in the time required to reach complete anesthesia.

More rapid bone anesthesia can be achieved by injecting the solution directly beneath the periosteum. The solution is held beneath the inelastic periosteum, and pressure is thus exerted to produce more rapid diffusion into the bone. This method requires less solution to be injected, but it is likely to be more painful for the patient and may result in the stripping of the periosteum from the bone.

The periodontal injection is accomplished by injecting the solution into the periodontal membrane. This is a painful injection, and four insertions of the needle are required for each tooth. The method has little value. Other methods will produce equally good anesthesia with much less discomfort for the patient.

The intra-osseous injection has little to recommend it. The technic requires an operation to introduce the procaine into the bone.

Precautions

The use of local anesthesia has greatly extended the field of oral surgery. It has made routine office practice of many surgical procedures that would otherwise require hospitalization. Local anesthesia has gone a long way toward reducing the hazards of general anesthesia in mouth surgery. It has made surgical operations safer for the patient and has made it possible for a larger number of dentists to become oral surgeons. Yet, the very simplicity of the administration of local anesthetics is an incentive to carelessness. The careless administration of local anesthetics is an invitation to complications.

The requirements for successful local anesthesia are simple but exacting. The administration of local anesthetics must be considered as a surgical procedure, and the basic principles of surgery must be followed. The feeling that the mouth is an infected cavity and that any semblance of aseptic technic is unnecessary is to be deplored. The local bacterial inhabitants may be thoroughly conditioned to their surroundings, but transplanting these organisms on the tip of a needle to a different location may result in the same disastrous infection that can be produced by the introduction of bacteria not accustomed to the patient's mouth.

The sterilization of the needle and syringe requires no elaborate equipment. All that is required is a method of boiling before using and a technic that will prevent contamination before the solution is injected. In an established oral surgery practice, office routines are

worked out so that adequate sterilization of anesthetic equipment is rigidly followed. It is in the office where only an occasional anesthetic is given that one may see the syringe and needle ready for use on the glass shelf of the instrument cabinet. In another method not uncommonly seen, the syringe and needle are carefully sterilized and then laid on the unsterile bracket table while the site of injection is swabbed with iodine. It is a simple thing to boil the equipment in a small tray, thus providing a sterile needle and syringe plus a sterile resting place for them.

The preparation of the tissue at the site of injection is just as important as the sterilization of the syringe. For the extra-oral injections, the technic of preparing the skin should be just as rigid as that for major operations. The skin should be cleaned with alcohol, dried with ether, painted with iodine and the iodine allowed to dry before it is removed with alcohol.

The preparation of the mucous membrane of the mouth must be done with equal care. The tendency to swab the site of injection with iodine and then to allow the patient to expectorate the excess is to be condemned. A careful technic requires that the site be first dried by sponging and mechanically cleaned of superficial debris. Then the dried area should be painted with iodine or some other equally effective antiseptic. Once the area is covered with the antiseptic the patient should not be permitted to close the mouth until the injection has been completed.

The use of a topical anesthetic to eliminate the pain of the needle passing through the mucous membrane has much to recommend it. If the topical anesthetic is contained in an antiseptic solution, so much the better. However, the same rule applies as with iodine. Once the topical anesthetic has been painted on the mucous membrane, the mouth should not be allowed to close until the injection is completed. If a sharp needle is used and the injection is done carefully, the pain from the insertion of the needle should be minimal.

Premedication

Premedication of the patient, while not required, in many cases can be extremely valuable. Many patients have a fear of surgical operations under local anesthesia. This fear may become so pronounced that patient cooperation cannot be obtained. The result is frequently a poorly performed operation and an exhausted operator and patient. In some cases the patient's cooperation will be so poor that the operation cannot be completed and a general anesthesia is resorted to. Many of these patients can be handled under local anesthesia if they are properly medicated before operation. There are many cases where the surgeon, against his better judgment, permits the patient to dictate the type of anesthesia. There are definite indications for the use of general anesthesia and for the use of local anesthesia. The decision as to the method selected should rest with the surgeon.

The careful use of the barbiturates preoperatively will overcome the objections of many patients to the use of local anesthesia. In selecting the barbiturate, the surgeon should pick one in the group that provides the least unpleasant aftereffects. I prefer Seconal (sodium propylmethylcarbinylallylbarbiturate), pentobarbital sodium or Sodium Amytal (monosodium salt of isoamylethylbarbituric acid). Phenobarbital will give excellent results, but the unpleasant aftereffect is more pronounced. Selection of the dose to be given requires good judgment. The surgeon must size up the nervous temperament of the patient and give a dose large enough to provide adequate sedation. In general, a dose of 0.1 to 0.2 gm. of Seconal one hour before operation will be adequate. Care must be taken that the premedicated patient is

provided with an escort. Serious accidents have happened when a patient, groggy from a barbiturate, has left the surgeon's office to drive his car home.

Complications, directly traceable to the injection of a local anesthetic, are many in number. Some of these complications may be extremely serious, but fortunately most of them are more annoying than serious.

Syncope

One of the most commonly experienced complications is syncope. The clinical signs of syncope closely resemble the classical signs of shock. The patient becomes ashen gray, the skin is cold and clammy, and, if the patient is not promptly treated, consciousness may be lost. The pulse may become rapid but is usually strong. There may be some drop in blood pressure but this is transient.

The cause of syncope after the injection of procaine is probably psychic. Exactly the same reaction has been produced in known "fainters" by the injection of sterile Ringer's solution. The response to simple treatment is too prompt to indicate that the reaction is the result of the toxicity of procaine. In some cases the tachycardia produced by the vasoconstrictor in the solution may add to the psychic trauma of the injection and be an additional factor in producing syncope.

The operator should be on the alert for the occurrence of syncope, and, at the first sign of change in the patient's color, the patient should be placed in a head down position or bent sharply at the waist until the head is between the knees. A sponge soaked in aromatic spirit of ammonia and held under the patient's nose may be all that is necessary if the reaction is noted early enough. The treatment of syncope may have to be repeated at intervals throughout the operation but rarely is syncope an indication for stopping the operative procedure. If the tendency to fainting is known to the surgeon, adequate premedication is of much value.

Shock

There is great doubt in my mind as to whether true shock, in which there is drop in circulating blood volume, with hemoconcentration in the peripheral circulation, ever occurs as the result of injecting procaine. Occasionally a patient will suffer a complete collapse soon after the injection is made. The patient presents the same signs as are seen in syncope, but the reaction is much more severe. Consciousness is usually lost, the pulse is rapid and thready, blood pressure drops, and in the more severe reactions respiration may cease. This reaction closely resembles primary surgical shock.

These patients do not recover with the rapidity seen in syncope. Prompt and effective treatment is required to prevent a catastrophe. The patient should be placed in a supine position with the head lower than the rest of the body. A respiratory stimulant such as 1 cc. of Coramine (25 per cent solution of pyridine betacarboxylic acid diethylamide)* should be given intravenously. Provision for an adequate airway should be made, and oxygen and artificial respiration should be started if necessary. In the event that this reaction is associated with cardiac failure, epinephrine should be given by intravenous or intracardiac injection.

I believe that these symptoms represent a true toxic reaction to procaine. The possibility that the drug was injected directly into a blood vessel would be difficult to prove because of the inability to aspirate with the modern cartridge syringe.

The prevention of shock is difficult. The only lead the operator has is a history of a similar episode when procaine

*Not accepted by the Council on Dental Therapeutics.

was injected. Any patient giving such a history should be questioned carefully and a procaine anesthetic avoided if the history seems to be reliable. It may be difficult to determine whether the patient is describing syncope or true collapse. In any event, the patient should be given the benefit of the doubt if the issue is in question.

Cardiac Complications

Cardiac complications such as precordial pain or coronary thrombosis, when they occur, are caused by the vasoconstrictor in the solution and are apt to be serious. This complication can be avoided if a careful history is taken in any questionable case. Procaine itself is not contraindicated in heart disease, although the operations that are performed after anesthesia may be. Many cases of severe coronary heart disease will suffer no ill effect from procaine without a vasoconstrictor. Even in the patient with a normal heart an unpleasant cardiac sensation may result from the use of epinephrine. This unpleasant sensation is related to tachycardia and is transient. It is not a contraindication to the use of a vasoconstrictor in the anesthetic solution.

Infection

Infection as a direct result of the injection is, fortunately, fairly uncommon. When it does occur, it is serious. The two most likely sites for abscess formation from needle-borne infection are: (1) the lateral pharyngeal space after a mandibular nerve block and (2) the pterygoid region after a posterior superior alveolar nerve block, the tuberosity injection. Infection in the lateral pharyngeal space will first manifest itself by trismus followed by swelling in the lateral neck region. Pain is constant, and difficulty in swallowing may be associated with this infection.

Needle-borne infections in the pterygoid region also announce their onset by trismus followed by swelling of the face. An infection in this area may be mistaken for an acute parotitis. It is important to make an accurate diagnosis since the surgical approach to the infection may be different. A history of a tuberosity injection, onset of trismus before, or accompanied by, swelling of the face, and the absence of pus from Stensen's duct will aid in making the diagnosis. Prompt drainage of abscess formation in these areas is important. Osteomyelitis of the coronoid process may result from abscess formation in the pterygoid region. Prompt and vigorous use of chemotherapy at the first evidence of infection is indicated and may, in some cases, eliminate the need of surgical intervention. This must not be depended upon and, when abscess formation has taken place, the chemotherapeutic drugs, while they are an adjunct to treatment, will not eliminate the need for surgical drainage.

Needle Breakage

Occasionally, even in the most experienced hands, a needle will break. This accident is most likely to happen during a mandibular or posterior superior alveolar nerve injection. These two injections subject the needle to lateral strain. Needle breakage usually occurs at the hub. If the operator will observe the rule of always leaving 1 cm. of the needle distal to the hub exposed, breakage at this point, when it occurs, permits ready recovery of the broken fragment. If breakage occurs at or beneath the mucous membrane surface, recovery of the fragment may be difficult.

Another annoying but usually not serious complication is the hematoma that follows accidental puncture of a blood vessel. The commonest location for this accident is in the area of the posterior superior alveolar nerve. The accident is fairly dramatic in that the onset of the swelling is prompt and the increase in size of the swelling can be

observed. In the absence of infection, the swelling will subside in a few days and no treatment is indicated. The amount of hemorrhage is self-limited. When sufficient pressure has been built up in the tissue, the bleeding will stop. As the swelling subsides, ecchymosis of the skin may appear. This accident may be difficult to explain to the patient, particularly when ecchymosis appears over an extensive area of the face.

Pain

Pain at the time of injection and after the effect of the anesthetic has worn off is an annoying complication and one that causes many patients to reject local anesthesia. It is a complication that to a large extent can be avoided. The use of a topical anesthetic at the site of injection will eliminate the pain of the needle passing through the mucous membrane. A good technic will accomplish the same thing. If every needle used were examined by the surgeon with an eye to using that needle on himself, there would be no such thing as a dull needle or one with a crochet hook where the bevel should be. A sharp needle will pass cleanly through the tissue and without pain. A dull or hooked needle must tear its way through.

Once the needle has passed through the mucous membrane, it should be advanced slowly and, if a little procaine is deposited ahead of the needle, discomfort will be lessened. When the site of injection is reached, the solution should be deposited slowly. The rapid distention of tissue by the deposition of solution is painful. This is especially true in those areas where the tissue has little elasticity, such as the palate.

Postoperative pain can be directly attributed to the injection if certain principles are violated. A solution injected so rapidly as to cause undue distention of the tissue will cause postoperative pain. Injections made beneath the periosteum with sufficient force to tear this tissue will be painful. The use of a solution that is not isotonic will set up changes in osmotic pressure severe enough to cause tissue damage and postoperative pain. When a hypotonic solution is injected, there will be swelling of the tissue cells owing to their higher osmotic pressure. A hypertonic solution when injected will draw fluid from the tissue cells until the osmotic pressure is equalized. This complication is not likely to occur when the commercially prepared procaine cartridges are used.

Care must be taken by those preparing their own solution to insure that isotonic Ringer's solution is used. This is difficult when stock solutions are prepared and then boiled to sterilize. There is some evaporation as a result of boiling, and a hypertonic solution results. In our clinic, the procaine solution is prepared by boiling distilled water and then adding a tablet containing the procaine, the vasoconstrictor and the Ringer's constituents.

Trismus

Trismus after the injection of local anesthesia may be the result of depositing the anesthetic solution in one of the muscles of mastication. In this event, the onset of trismus is prompt. Trismus which develops later may be due to infection.

Prolonged Anesthesia

Prolonged anesthesia is another annoying but not serious complication. It is more commonly seen after a mandibular nerve injection and may result from trauma to the nerve by needle injury. Advance warning of this complication is served on the operator if the patient suddenly complains of an "electric" shock in the lip. In this event the needle should be withdrawn slightly before the solution is deposited. Another cause of prolonged anesthesia is the accidental injection of alcohol still contained in the syringe and needle from the sterilizing

solution. This may happen when glass syringes are kept in alcohol and not rinsed before the anesthetic agent is drawn into the syringe.

Paralysis

Occasionally, in the use of infiltration anesthesia in the soft tissues of the face, one or more branches of the seventh nerve will be anesthetized with a paralysis of the facial muscles supplied by the affected nerve fibers. This paralysis is temporary and need cause no concern. If the lower eyelid happens to be involved, the patient should be cautioned to keep the eye covered until the anesthesia has worn off. More often profound block anesthesia will produce an apparent facial paralysis. The affected area has the same drooping appearance seen in a true seventh nerve paralysis, but the muscles in the affected area can be moved by voluntary action. The reason for this apparent paralysis is the lack of muscular movement that normally follows the transmission of sensory impulses.

This same loss of sensation can be responsible for the gagging sensation experienced by some patients. Patients will complain that the tongue or palate is swollen, owing to the fact that anesthesia has disturbed the normal sensation pattern. This sense of fullness in the throat precipitates the gagging reflex partly from psychic reasons and partly from the fact that loss of sensation prevents the involuntary motor control that is part of the habit pattern for that person. When this complication occurs, there is little that can be done except to reassure the patient and wait for the anesthesia to wear off.

Conclusion

The search for a better anesthetic agent than procaine has continued, and today there are other agents available, both anesthetic and vasoconstrictor. There has been much controversy over the value of these newer drugs as compared with the old procaine-epinephrine combination. They are said to be less toxic than procaine and to produce more profound anesthesia with less disturbance from the vasoconstrictor. There is much evidence to support these claims, but I do not propose to enter into the controversial discussion of the advantages and disadvantages of these drugs. Procaine has been the drug of choice for many years; but it is hoped that continued progress in local anesthesia will produce an agent even safer and more effective than procaine. Any of the agents now in common use will produce a good anesthesia if carefully administered; yet somewhere in the future there must be a still better agent. —*630 West 168th Street.*

Books.—Books are tangible property, and their sponsors must not only provide for them but make it possible for others to use them. Money gets dissipated, and committees disagree as to how it had best be invested or expended. No such questions arise when books are concerned; and the soul of an institution that has any pretense to learning comes to reside in its library, no less than does the soul of a profession or of an individual.—***Consecratio Medici and Other Papers. Harvey Cushing. Boston: Little, Brown and Company, 1940.***

THE ANATOMY OF MANDIBULAR ANESTHESIA

Harry Sicher,* M.D., Chicago

ALL oral surgeons and dentists will agree that both general and local anesthesia are indispensable if the welfare of the patient is the leading thought of operative procedure. How these two methods of pain prevention should be limited is still a burning question. Even the most enthusiastic defenders of one method will concede that in a certain number of cases the other method is necessary. If this is true, then it is clear why, in this issue devoted to general anesthesia, some space has been reserved for a discussion of local anesthesia.

Need for Anatomic Knowledge

Only if the operator is equally skilled and experienced in both methods will the selection of either one be unbiased. And this seems to be a crucial point. General anesthesia is mechanized to a high degree while local anesthesia defies any mechanization. There is only one method of teaching and learning local anesthesia, and this is by building the technic on a solid anatomic basis. Despite the professed unanimity of all authors on this point, anatomic knowledge is sadly lacking and is generally replaced by attempts to give detailed technical rules. For example, a recent article† on anesthesia of the lower dental arch contains the following statements: "Instruct the patient to hold the mouth comfortably wide open. . . ." "It has been stated by some authorities that the distance from the internal oblique line to the distal border of the sulcus—at injection height—is standardized by nature. . . ." The author is not fully in agreement with those who advocate contact of the needle with the bone. He invents some new anatomic structure: "Shortly after the needle has been inserted superficially . . . some cases present a resistance to its progress. . . . This resistant tissue, which varies a great deal in its toughness, is fascia, a form of muscular tissue. It spreads across the opening to the natural channel between the internal pterygoid muscle and ramus like the web in a frog's foot."

If this is presented as anatomic basis for the "mandibular block," then it is small wonder that failures are the rule and successes the exception and that dentists, discouraged, give up local and hopefully turn to general anesthesia. And this is unfair to the patient.

A secure technic of local anesthesia has to be the logical consequence of anatomic facts.

There are a few general principles which are valid for all types of local anesthesia. The first and most important is that the technic has to embody the individual variations. This cannot be done by working with linear or angular measurements, which are by their very nature average values. It has to be done by selecting for the injection those landmarks that are individually fixed and are correlated to each other so that their recognition makes the operator independent of individual variation. Most land-

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†It is assumed that the author would prefer anonymity.

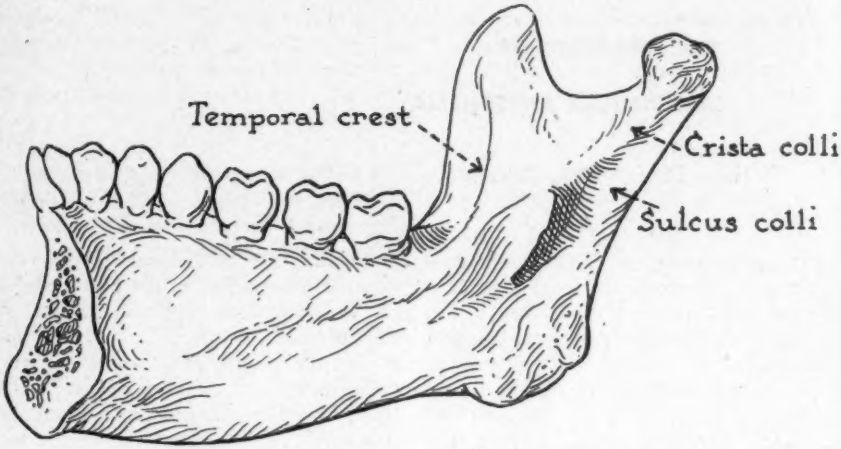

Fig. 1.—Medial aspect of the right half of a mandible

marks are points of the skeleton, but not all of them are accessible to the eye or to the palpating finger. One has to project the examination into the depth, and this can be done by extending, as it were, the finger into the tissues by palpating with the point of a needle. If such a procedure is to be successful, an inflexible, rigid needle has to be used.

It is, in this paper, impossible to consider all the various types of local anesthesia of teeth and jaws. The conduction anesthesia or block anesthesia of the inferior alveolar nerve—what is generally called the mandibular block—and of the related nerves is used to show how anatomy can serve the anesthetist.

Inferior Alveolar Nerve

Ridges, crests and grooves of bones are the most important landmarks in local anesthesia. Since the inferior alveolar nerve is reached above the mandibular foramen, it is necessary to describe the inner surface of the mandibular ramus (Fig. 1). Almost exactly in the center of this surface, the mandibular canal starts with a wide foramen, the mandibular foramen. At its antero-inferior circumference, a variable bony process is found, the mandibular lingula. At its postero-inferior circumference, a narrow, sharply demarcated furrow commences which can be followed in a straight line downward and forward. In this furrow lies the mylohyoid nerve.

Temporal Crest

At the tip of the coronoid process, a sharp and slightly irregular crest begins which runs straight down over the coronoid process and then continues on the medial surface of the ramus, becoming increasingly prominent in its downward course. Behind the last molar the crest bends into a horizontal plane and widens to a rough triangular field, the retromolar triangle. The prominent medial and lateral borders of the triangle continue into the buccal and lingual alveolar crests. The described crest on the medial surface of the ramus serves for the attachment of the deep tendon of the temporal muscle and is, therefore, best designated as the temporal crest. This descriptive term is preferable to the term commonly used, namely, internal oblique line. Between this crest and the anterior border of the ramus, the bone is depressed to the retromolar fossa, a groove

variable in its width and depth. The retromolar fossa continues downward and forward into a shallow groove between the alveolar process and the oblique line.

Ridge of the Mandibular Neck

Another ridge on the inner surface of the mandibular ramus begins at the inner pole of the mandibular condyle, crosses the mandibular neck in a forward and downward course and continues to the region above and in front of the mandibular foramen. From here on, it fuses with the elevation of the temporal crest. This ridge is of variable height and, in contrast to the temporal crest, is smooth and blunt. Because of its relation to the neck of the mandible and because it is here that this crest is most prominent, it may be designated as the ridge of the mandibular neck. It is the main buttress of the mandibular ramus and transmits the forces of mastication from the base of the alveolar process to the mandibular head and from there to the base of the skull. This buttress or trajectory, consisting of strengthened and parallel trabeculae of the spongy bone and a thickened layer of compact bone, bulges toward the inner surface of the mandibular ramus, thus causing the elevation described as the ridge of the mandibular neck. Behind and below the ridge, the bone is depressed to a shallow groove, the groove of the mandibular neck. It is bounded posteriorly and inferiorly by a more or less prominent, fine and sharp ridge to which the sphenomandibular ligament is attached. The groove itself leads into the mandibular foramen. However, this groove is of no significance in itself and owes its existence only to the prominences of the bone in front of it and behind it.

In all persons, the temporal crest can be palpated medially and posteriorly to the anterior border of the mandibular ramus. Between these two prominent bony crests, the retromolar fossa also can be located. The temporal crest is best found at its lower end immediately behind the lower third molar because it is highest at this level. It should, however, be pointed out that we do not feel the anterior border of the ramus of the mandible or the temporal crest itself but the firm and highly resistant fibers of the tendons of the temporal muscle attached to these lines.

Muscles

The anterior part of the temporal muscle ends in two tendons: the superficial tendon is attached to the anterior border of the ramus, the deep to the temporal crest. The deep tendon is stronger and longer than the superficial tendon. The two tendons diverge downward, forming an inverted V, between the legs of which the retromolar fossa is free of muscle attachment. The posterior part of the temporal muscle is inserted to the outer and inner surface of the coronoid process.

The inner surface of the mandibular ramus behind the temporal crest cannot be reached by the examining finger because it is covered by the internal pterygoid muscle. If a needle is introduced behind the temporal crest and made to glide backward over the inner surface of the ramus, it passes first over a smooth area of bone and then reaches and jumps over the ridge of the mandibular neck and into the groove behind it. Thus a surface of the bone not accessible to eye or palpating finger can be explored by using a needle as an extension of the finger. Contact with the bone is essential. It is not only guidance to a certain point but also guidance away from structures which otherwise might be injured.

The inferior alveolar nerve releases all the lower dental nerves in the mandibular canal and participates also in supplying the interdental papillae and the most distal and mesial areas of the buccal gingiva. Furthermore, its mental branch, the mental nerve, supplies mucous mem-

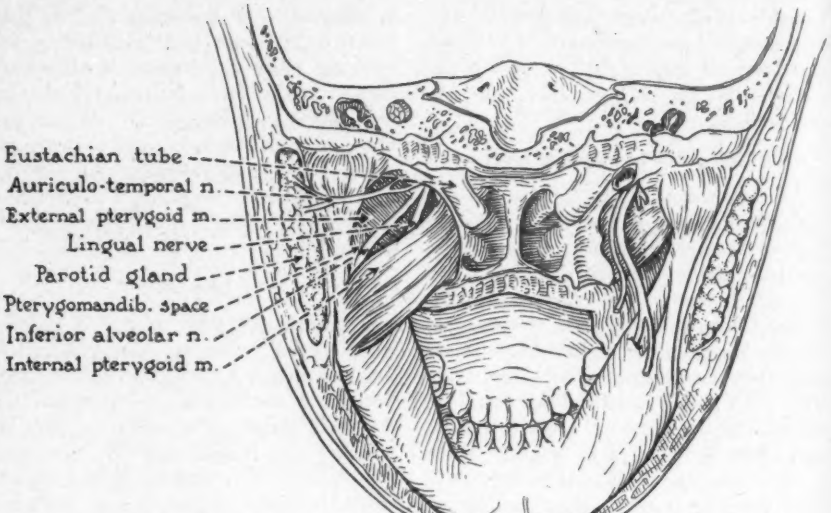

Fig. 2.—Relation of the inferior alveolar nerve to the mandible and the pterygoid muscles (posterior view). The head was cut frontally behind the mandibular articulations. The soft palate and the tongue were removed. On the right side the internal pterygoid muscle was removed to expose the entire course of the inferior alveolar nerve and the external pterygoid muscle

brane and skin of the lower lip and a variable area of the skin of the chin. The buccal gingiva in the middle parts of the lower jaw is supplied by the buccinator or (long) buccal nerve, the entire lingual gingiva by branches of the lingual nerve.

Pterygomandibular Space

The inferior alveolar nerve can be reached in the pterygomandibular space just before the nerve enters the mandibular foramen. The pterygomandibular space is a well-defined space between the mandibular ramus and the pterygoid muscles (Fig. 2). Its vertical lateral wall is formed by the inner surface of the ramus of the mandible, its slanting medial wall by the internal pterygoid muscle, its roof by the external pterygoid muscle. In frontal section the pterygomandibular space is triangular, narrowing downward where the internal pterygoid muscle converges with the bone to which it is attached. The pterygomandibular space communicates posteriorly with the retromandibular and infratemporal grooves. It is thus in relation with the parotid gland, which fills the space behind the mandibular ramus. From the infratemporal fossa, the lingual and inferior alveolar nerves enter into the pterygomandibular space.

Anteriorly the pterygomandibular space is accessible between the anterior border of the mandibular ramus, to which the tendons of the temporal muscle are inserted, and the anterior border of the internal pterygoid muscle. The entrance into the pterygomandibular space is separated from the oral cavity by the thin plate of the buccinator muscle and the mucosa of the most posterior part of the cheek. Between the anterior border of the ramus and the internal pterygoid muscle, the pterygomandibular space communicates with the submaxillary niche. This communication at the inferior

corner of the pterygomandibular space is used by the lingual nerve to enter the submaxillary region from where it passes into the oral cavity by reaching the upper and medial surface of the mylohyoid muscle.

The pterygomandibular space is filled with loose connective tissue which contains a variable amount of fat. The contents of the space are the lingual nerve in front and the inferior alveolar nerve behind. Posterior to the alveolar nerve are found the inferior alveolar artery and veins which converge with the nerve toward the mandibular foramen.

The inferior alveolar nerve passes through the pterygomandibular space obliquely from above and medially downward and laterally (Fig. 2). It separates from the lingual nerve a few millimeters below the oval foramen and is here situated on the medial side of the external pterygoid muscle. Farther downward it crosses the posterosuperior border of the internal pterygoid muscle and enters the pterygomandibular space through the narrow cleft between the two pterygoid muscles. Where the alveolar nerve reaches the pterygomandibular space, it is separated from the mandible by the external pterygoid muscle; below this muscle the nerve converges with the mandibular ramus and reaches it at the mandibular foramen. Above the foramen the nerve has no contact with the bone, and the distance between bone and nerve increases rapidly. Only a short distance in front of the inferior alveolar nerve lies the lingual nerve. The latter receives the chorda tympani where it enters the pterygomandibular space.

Landmarks for Injection

Since the inner surface of the mandibular ramus has to be used as a landmark for the injection to the inferior alveolar nerve, it becomes clear that this injection has to be done as close to the plane of the mandibular foramen as possible. The higher the injection, the farther away will the injected fluid be from the alveolar nerve (Fig. 2). Since the mandibular foramen is situated in the extension of the occlusal plane of the lower molars, the injection should be made not more than 3 to 4 mm. above this plane. If molars are absent, the plane of the foramen can be found by halving the posterior border of the ramus and placing an imaginary line through this point and parallel to the lower border of the mandible in the molar region.

A shallow groove extends upward and backward from the mandibular foramen to the neck of the mandible, the groove of the mandibular neck. Formerly this groove had been termed groove of the mandibular nerve because the inferior alveolar nerve (mandibular nerve) was believed to lie in this depression of the bone. It has been mentioned that the mandibular nerve has no relation to the inner surface of the mandibular ramus above the mandibular foramen. Traced back from this point, the inferior alveolar nerve can be followed upward and inward to the oval foramen while the plane of the ramus is vertical. In addition, the groove of the mandibular neck runs from the mandibular foramen upward and backward so that this groove and the alveolar nerve diverge in two directions (Figs. 2 and 3).

Changes During Jaw Movements

The suggestion to use the groove of the mandibular neck as a landmark for the anesthesia of the inferior alveolar nerve was originally made because of the supposed close relation of the nerve to this groove on the inner surface of the mandibular ramus. Despite the fallacy of this reasoning, the injection into this sulcus is entirely justified. This paradoxical statement can be made because of the peculiar and rather radical changes in the relation between the alveolar nerve and the groove of the mandibular neck during the movements of the lower jaw (Figs. 3 and 4).

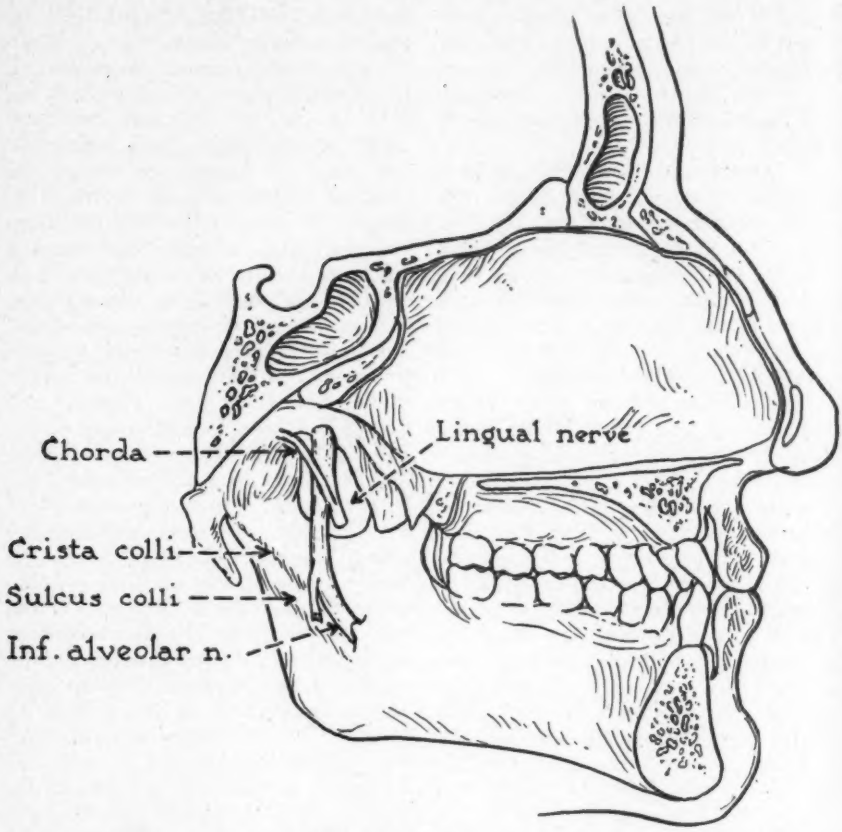

Fig. 3.—Relations between the inferior alveolar nerve and the groove of the mandibular neck (sulcus colli) with the jaws closed

As long as the mouth is closed, there is a double divergence between groove and nerve. If the mouth is opened as wide as possible, the mandibular head glides from its position in the articular fossa forward and to the height of the articular eminence and often even somewhat farther forward. At the same time the mandible rotates around a horizontal and transverse axis, passing through the condyles and moving forward and downward with the condyles. During the opening movement, the mandibular foramen, the point of entrance of the inferior alveolar nerve into the mandibular canal, drops a few millimeters from its position without deviating anteriorly or posteriorly. This behavior of the mandibular foramen can also be expressed by stating that the entrance of the nerve and blood vessels into the bone is at the point of relative rest.

The inferior alveolar nerve thus does not alter its course during the opening movement of the jaw but is slightly stretched. The flat s-shaped curve which the nerve describes in rest position of the mandible provides the necessary slack for

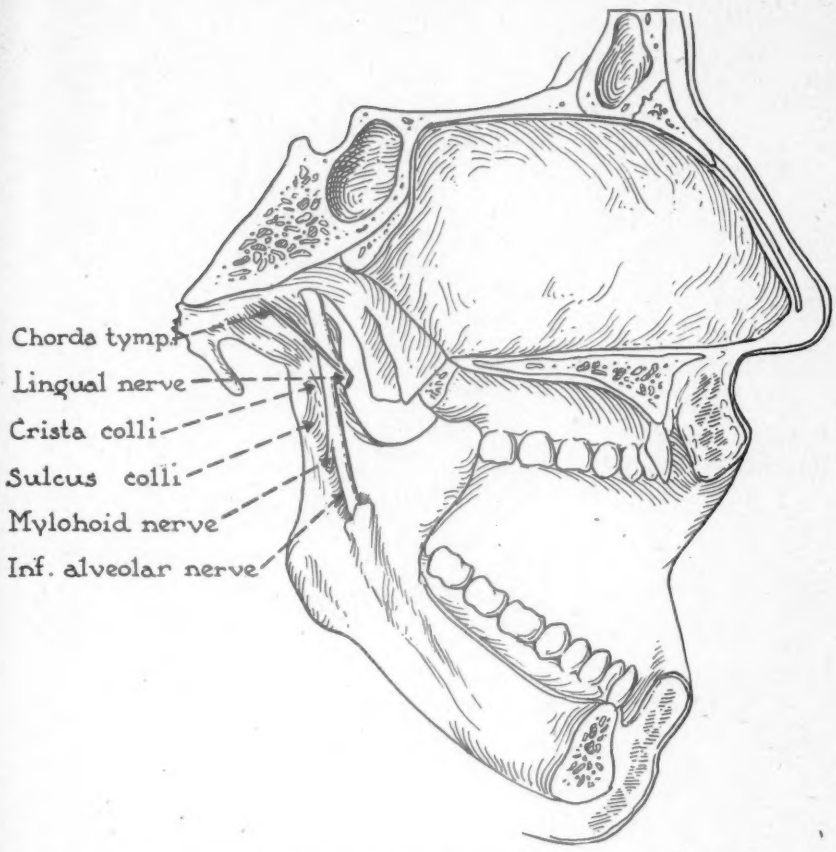

Fig. 4.—Relations between the inferior alveolar nerve and the groove of the mandibular neck (sulcus colli) with the jaws wide open

the extension of the nerve during the opening movement. While the nerve remains in its position, the groove of the mandibular neck has changed from an oblique course upward and backward in rest position of the mandible, into an almost vertical position at the end of the opening movement. Thus in this position of the mandible, but only in this position, the inferior alveolar nerve and the groove of the mandibular neck are almost exactly in the same frontal plane, so that now the groove of the mandibular neck is a landmark for the alveolar nerve. It must be remembered that the nerve turns from the mandibular foramen upward and inward away from the vertical plane of the mandibular ramus. Thus the lowest part of the groove of the mandibular neck can very well be used as the target area for the injection to the inferior alveolar nerve if the mouth is opened as wide as possible, but only in this position.

Two important rules for the anesthesia of the inferior alveolar nerve can be deducted from the described relation between nerve and bone. First, the injection has to be done while the mouth of the

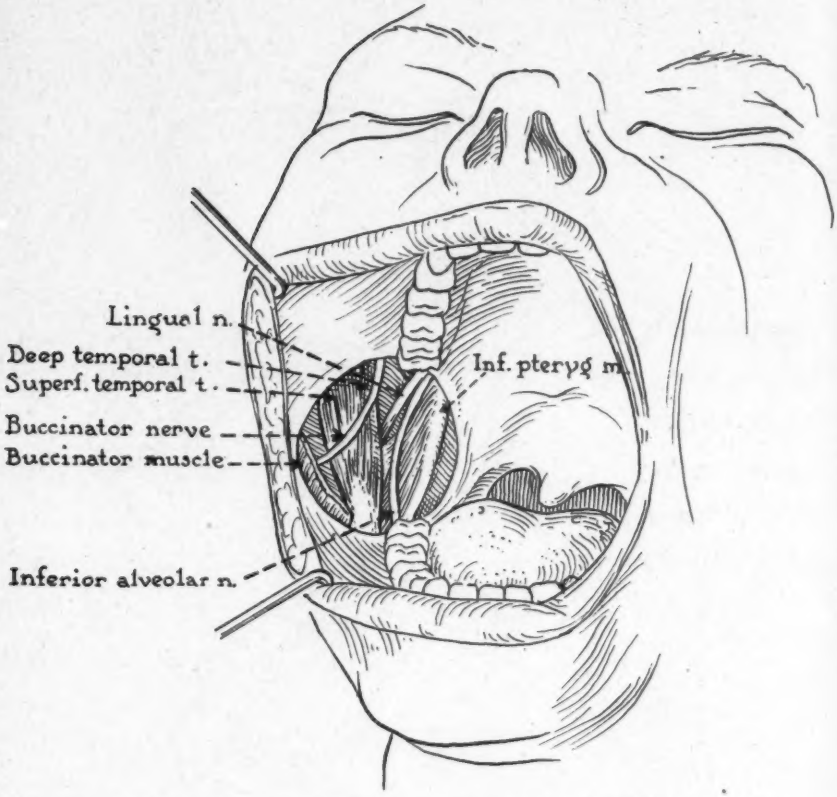

Fig. 5.—Pterygomandibular space dissected from the oral cavity

patient is opened to the maximum extent, and, second, the injection should be made into the lowest part of the groove of the mandibular neck. The higher the injection is made, the farther away from the nerve will the depot of the anesthetic fluid be and if the patient closes the mouth to a "comfortable" position there is no relation between the groove and the nerve.

Insertion of Needle

In order to reach the lowest part of the groove of the mandibular neck, the needle should glide along the inner surface of the mandibular ramus until it jumps over the crest of the mandibular neck, a movement which is easily felt. The needle should be placed parallel to the occlusal plane of the lower molars and only slightly above this plane. If the index finger is pressed upon the last molar, the nail of this finger, facing upward, indicates the suitable plane.

The entrance into the pterygomandibular space is between the anterior border of the internal pterygoid muscle and the tendons of the temporal muscle (Figs. 5, 6). The deep tendon of this muscle attached to the temporal crest of the mandible juts far medially, restricting the width of the entrance. It is inad-

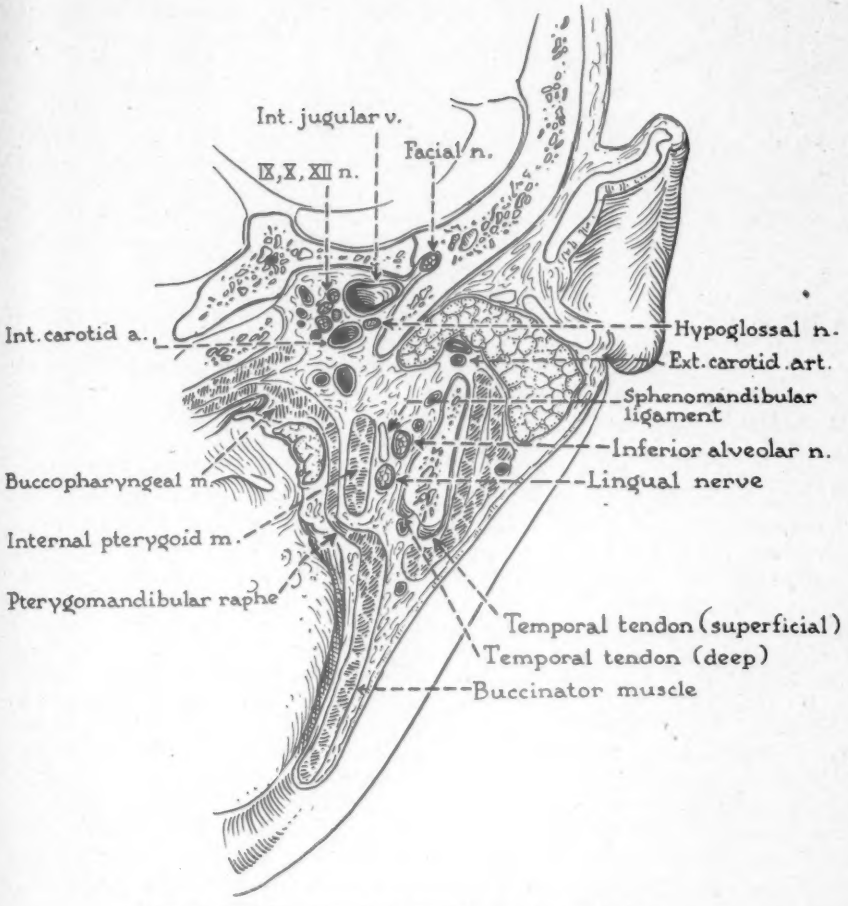

Fig. 6.—Section through the head in the plane of injection

visable to reach the bone in front of this tendon, that is, in the retromolar fossa. If this is done, the needle has to be maneuvered around the tendon to gain, for the second time, contact with the bone (one-two-three method). It is much easier to reach the bone behind the tendon and thus to eliminate from the start a fairly formidable barrier to the progress of the needle. Since the deep tendon of the temporal muscle can be palpated with the finger in every person, no difficulty is encountered in inserting the needle behind this tendon.

The needle should be placed as nearly into a frontal plane as the cheek of the opposite side permits, in order to reach the bone by the shortest possible route. If the syringe and needle then are turned toward the side on which one operates, a position is soon gained which allows an easy gliding of the needle along the inner surface of the ramus. The periosteum is neither a hindrance nor is it

Fig. 7.—Pterygomandibular fold (x). The position of the hands and the syringe in injecting on the left side of the patient is shown

injured by the needle. The needle then glides along the smooth and even surface of the bone which extends between the temporal crest and the ridge of the mandibular neck until the passage over this blunt ridge into the groove of the mandibular neck is felt.

In entering the pterygomandibular space, the operator should avoid an injury to the internal pterygoid muscle. The pterygomandibular fold (Fig. 7) may serve as a landmark for the anterior border of this muscle. This fold arises in the region of the pterygoid hamulus, medially and posteriorly to the posterior end of the upper alveolar process, and extends downward and outward, ending behind the last lower molar. The fold is elevated by the pterygomandibular raphe, a tendinous band which gives rise to

fibers of the buccinator muscle anteriorly and fibers of the superior constrictor of the pharynx posteriorly. This tendinous band is stretched while the mouth is opened, and thus the fold of the mucous membrane becomes clearly visible. If the needle pierces the mucous membrane lateral to the pterygomandibular fold, an injury to the internal pterygoid muscle can be avoided easily.

Intra-Oral Technic

The technic of the intra-oral injection to the inferior alveolar nerve can be summarized as follows. The patient is instructed to open the mouth as wide as possible and to keep it open as wide as possible throughout the injection. The anterior border of the ramus with the attached superficial tendon of the temporal muscle is palpated first; then, close to the level of the lower alveolar process, the index finger slides inward and backward and encounters the lower end of the temporal crest and the attached deep tendon of the temporal muscle. The finger is now placed upon the occlusal surface of the last molar, the nail facing upward. The finger tip touches the temporal crest. If molars are absent, the fingernail is just above the horizontal plane through the mid-point of the posterior border of the ramus and parallel to the inferior border of the mandible.

The syringe and needle (22 or 21 gage, 1½ inches long) are placed into, and then kept in, a plane parallel to the occlusal plane of the molars and are put, as far as the opposite corner of the mouth will permit, into a transverse position. The needle pierces the mucous membrane above the fingernail and lateral to the pterygomandibular fold. It is so directed that it reaches the bone behind the temporal tendon and crest. The needle is then freely movable. Penetration of the tendon is diagnosed by the restricted maneuverability of the needle. Now the syringe is swung toward the side on which the anesthesia is made, but only so far that the needle can slide easily backward along the bone. Care has to be taken to keep the syringe in the plane of injection. The needle is pushed backward until, with a slight jump, the ridge of the mandibular neck is passed and the groove of the mandibular neck is reached. After checking whether the needle has entered a vein (see page 1555), the operator injects 1½ to 2 cc. of the anesthetic solution. The injection is made into the loose connective tissue of the pterygomandibular space just lateral to and behind the nerve and just above the mandibular foramen.

Righthanded operators will use the left hand for palpating, the right for handling the syringe, if they operate on the right side of the patient. For the injection on the patient's left side, it is recommended to change hands, that is, to palpate with the right and to handle the syringe with the left hand (Fig. 7). Since the movements now are mirror movements, they are surprisingly easy and certainly easier than the forced and awkward positions so often described.

Extra-Oral Technic

From the foregoing description, it is clear that a secure intra-oral technic for the anesthesia of the inferior alveolar nerve is impossible if the patient cannot freely open his mouth. In such cases an extra-oral approach is indicated. Two ways of getting close to the alveolar nerve are feasible, one from the lower border of the mandible along its inner surface to the mandibular foramen, the other through the sigmoid notch of the mandible into the pterygomandibular space.

For the first method the following landmarks can be used. The mandibular foramen is situated halfway between the anterior and posterior borders of the mandibular ramus. It is found in a plane which is laid parallel to the lower border of the mandible through the mid-point of the posterior border of the ramus.

The needle is inserted in front of the

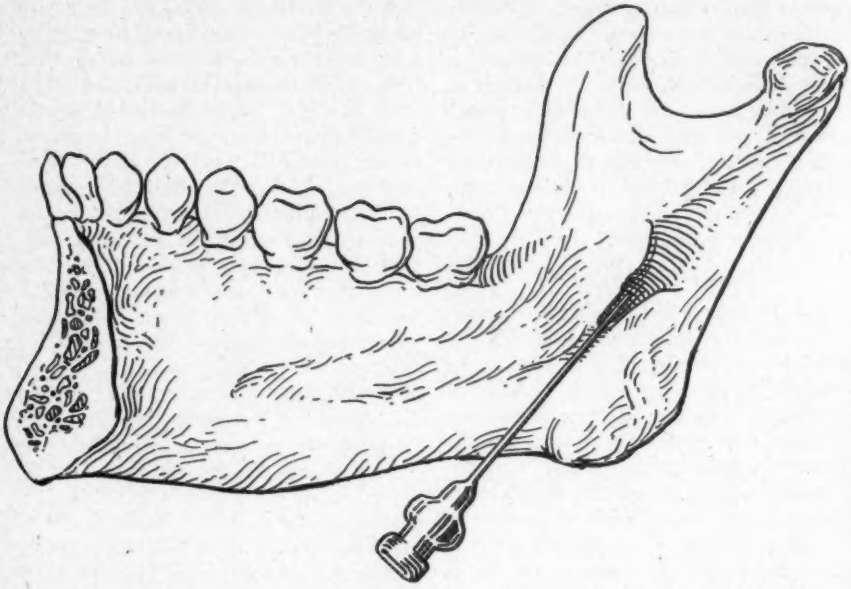

Fig. 8.—Position of the needle to the mandible in the percutaneous injection to the inferior alveolar nerve from the lower border of the mandible

geometric mandibular angle—the crossing of the extended posterior and inferior borders—in a distance corresponding to half of the width of the ramus (Fig. 8). The needle should reach the bone just above its lower border. From here the needle travels along the bone and always in contact with the bone, upward and backward parallel to the posterior border of the ramus until its point is 3 to 4 mm. above the plane of the mid-point of the posterior border. The point of the needle is then just lateral to the inferior alveolar nerve above its entrance into the mandibular foramen.

The injection is made into the loose connective tissue of the pterygomandibular space. The needle enters this space by passing through the most posterior part of the submandibular niche in front of the attachment of the internal pterygoid muscle. However, the fibers of this muscle which are attached at the anterosuperior corner of its triangular field of insertion may be pierced by the needle not far below the level of the mandibular foramen.

The approach to the inferior alveolar nerve through the sigmoid notch is less reliable, and therefore the injection of a larger quantity of anesthetic fluid is necessary. It should be remembered that, at the level of the lowest point of the sigmoid notch, the inferior alveolar nerve is at a considerable distance from the medial surface of the ramus which it approaches in a lateral and inferior course. To inject as close to the nerve as possible, it is advisable to direct the needle slightly downward while it passes over the bony edge bordering the sigmoid notch. The needle should be inserted through the skin just below the zygomatic arch. Passing through skin and masseter muscle, the needle may pierce the posterior fibers of the temporal muscle or may enter the pterygomandibular

space behind this muscle. Traveling downward and inward, the needle should not be inserted deeper than about 8 to 12 mm. beyond the plane of the sigmoid notch. The fluid will then infiltrate the connective tissue of the pterygomandibular space and thus reach the nerve, provided that 4 to 6 cc. is injected.

Incomplete Anesthesia

Assuming that by using one of the described methods the inferior alveolar nerve has been blocked, the anesthetic zone comprises the teeth of one-half of the mandible, the buccal gingiva in the posterior and anterior region of the mandible, the skin and mucous membrane of the lower lip and the skin of the chin. Fairly often the anesthesia is not complete in the region close to the mid-line. The cause for this incomplete anesthesia is said to be a crossing of the nerves to the other side over the mid-line, so that the central incisor or even both incisors receive fibers from right and left inferior alveolar nerves. This explanation is highly improbable since the two mandibular halves are separated by the symphyseal cartilage until the end of the first year of life. Nerves are not known to cross this or any other median cartilage.

A second explanation of the near median defect of a mandibular block postulates the participation of a branch of the cutaneus colli nerve of the cervical plexus in supplying sensory fibers to the mandibular incisor region. This legendary branch is supposed to enter the inner surface of the mandible close to the lower border in the bicuspid area. Careful investigations have shown that such a branch of the cervical nerves does not exist, as could have been expected from developmental facts. However, an injection to the area of the entrance of this imaginary nerve into the bone is sometimes helpful. An injection at this point is in fact an injection to the anterior branch of the mylohyoid nerve, situated between the lower border of the mandible and the mylohyoid muscle.

The mylohyoid nerve is known to contain regularly sensory fibers to the skin of the chin and, furthermore, sends a branch into the mandible in about 10 per cent of the persons examined. To assume that dental fibers may occasionally travel in the mylohyoid branch of the inferior alveolar nerve is in full accord with known facts of the anatomy and the variations of peripheral nerves. The dental fibers enter the bone not far from the mid-line and just above the lower border of the mandible. In persons in which the mylohyoid nerve separates from the inferior alveolar nerve some distance above the mandibular foramen, the anesthetic fluid, injected between alveolar nerve and bone, may not reach the mylohyoid nerve, which at this point is situated medially to the alveolar nerve. If the mylohyoid nerve contains dental fibers, they can then be reached before they enter the mandible.

In some rare cases, an otherwise perfect mandibular block will leave the third molar sensitive. The reason for this anomalous behaviour is a variation in the branching of the inferior alveolar nerve. The branch to the third molar, the posterior dental branch, is normally given off shortly after the alveolar nerve enters the mandibular canal. Sometimes, however, the posterior dental branch arises from the anterior surface of the alveolar nerve above the mandibular foramen, descends anteriorly and enters a small foramen in front of, and above, the mandibular foramen. This abnormal branch in front of the main nerve may escape anesthesia, since the fluid is injected laterally to, and slightly behind, the alveolar nerve. An injection of a few drops of anesthetic fluid just in front of the typical site of injection will block an abnormal posterior dental branch.

A well-known though not too frequent accident during mandibular block is a temporary paralysis of the facial nerve

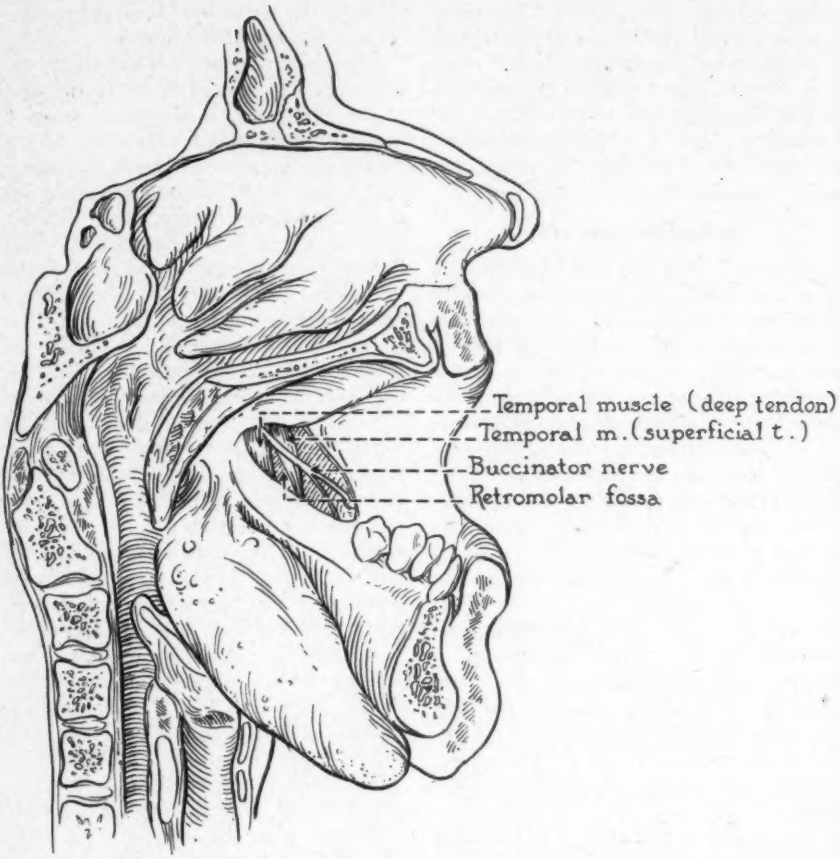

Fig. 9.—Relation of the long buccal nerve to the tendons of the temporal muscle

or of one of its two main branches. The motor paralysis is caused by a direct influence of the injected anesthetic solution on the fibers of the facial nerve. The clue to the mechanism is the fact that in such cases the sensory auriculotemporal nerve almost invariably is anesthetized. This nerve crosses the posterior border of the mandible at the level of its neck and supplies part of the outer ear, the temporal region and the posterior part of the cheek.

The involvement of the auriculotemporal nerve indicates that the injection was made too high above the mandibular foramen. If this is done, the needle is automatically directed closer to the posterior border of the mandibular neck. This is the effect of the obliquity of the ridge and the groove of the mandibular neck ascending to the posterior border of the mandibular neck. The facial nerve crosses at the same level from the retromandibular fossa into the face. In the majority of persons, the facial nerve is here embedded in the parotid gland and so protected from being reached by anesthetic fluid injected close to the pos-

terior border of the mandibular neck. It is well known that in some persons the parotid gland fails to envelop the facial nerve or one of its two main branches in the retromandibular fossa. Then the nerve or its superior or inferior branch may be infiltrated if the mandibular injection is made too high above the mandibular foramen. The ensuing paralysis is temporary and disappears with the absorption of the injected fluid.

In such cases of facial nerve paralysis, the taste fibers of the chorda tympani are paralyzed, but these fibers are not involved after experimental injection of an anesthetic to the facial nerve in the parotid gland. This has been taken as proof that there is not a direct and peripheral interference with the unprotected facial nerve. A fantastic chain of reflexes was then proposed as explanation. The fact was neglected that the fibers of the chorda tympani are incorporated into the lingual nerve where this nerve is anesthetized during the approach to the inferior alveolar nerve. The taste fibers of the facial nerve in the chorda tympani are thus blocked far away from their source.

Accidental Intravenous Injection

Another complication of the mandibular block is the accidental intravenous injection of all or part of the anesthetic drug, causing severe shock by overexcitation of the sympathetic nerves. It is surprising how frequently the needle is found to have entered a vein. The fact can easily be ascertained by routinely aspirating before the syringe is emptied in order to see whether blood enters the syringe or not. The frequency of positive tests and the obvious danger of an intravenous injection make it imperative that only a syringe which permits aspiration be used.

The reason for the high percentage of venous injuries seems to be the variable course of the inferior dental artery and veins. The relations of these vessels to the alveolar nerve and to the bone depend on the position of the internal maxillary artery and veins in front of the mandibular neck. If the internal maxillary artery follows a deep course on the medial side of the external pterygoid muscle, the inferior alveolar artery and the accompanying veins are quite closely related to the alveolar nerve. If, however, the internal maxillary artery lies superficially on the lateral surface of the external pterygoid muscle, the inferior alveolar artery arises in a more lateral plane and runs downward and laterally to the mandibular foramen between nerve and bone. Then artery and veins are, in the plane of injection, situated quite close to the bone and thus one of the veins is frequently punctured.

Lingual Nerve

The lingual nerve supplies the lingual gingiva and the adjacent mucosa of the lower jaw. Its anesthesia is necessary for any operation on the lower jaw which is not restricted to the teeth themselves. The lingual nerve can easily be reached in the pterygomandibular space. The nerve enters this space in front of the inferior alveolar nerve (Fig. 2). The two nerves, at first closely related, diverge downward, the lingual nerve deviating anteriorly. In the plane of the mandibular foramen, the lingual nerve lies between the internal pterygoid muscle and the mandibular ramus, a short distance behind the temporal crest and the deep tendon of the temporal muscle. In the intra-oral approach to the inferior alveolar nerve, the needle, reaching the bone just behind the temporal tendon and the temporal crest, passes between bone and lingual nerve if it is pushed toward the groove of the mandibular neck and sometimes even comes into contact with the lingual nerve. Injection of ¼ cc. of the anesthetic solution just posterior to the point where the needle touches the bone will suffice to anesthetize the lingual nerve.

Turning anteriorly below the floor of the mouth, the lingual nerve is quite superficially located at the level of the lower third molar and can here even be seen through the translucent mucous membrane in the sublingual sulcus. Though this point seems to be especially suited for an isolated anesthesia of the lingual nerve, it is inadvisable to inject in this area. A submucous injection here is dangerous because it is done at or even behind the posterior border of the mylohyoid muscle. In other words, this is an area where the muscular and fascial floor of the oral cavity is absent, and only the mucous membrane itself forms the boundary between the oral cavity and the tissue spaces of the neck. An infection in this area, which is not easily kept dry and sterile, would thus be an infection of the cervical tissues and could spread downward along the great vessels of the neck.

Buccal Nerve

In the majority of persons a small area of the buccal gingiva of the lower jaw is supplied by the (long) buccal or buccinator nerve. This area generally extends along the second bicuspid and first molar. It varies greatly: it may be reduced and may even be missing, or it may be larger and may in extreme cases extend from the cuspid to the third molar.

An anesthesia of the gingival fibers of the buccal nerve is in most instances easily produced by infiltration of the buccal mucosa near the fornix of the vestibule. There are, however, cases in which an infection in this area precludes a local injection and then the trunk of the buccal nerve should be reached.

The buccal nerve passes through the infratemporal fossa in a downward and forward direction. After crossing the deep surface of the temporal muscle, the nerve is situated between the anterior part of the masseter and the posterior part of the buccinator muscle. Turning more sharply forward, the buccal nerve divides into several branches on the outer surface of the buccinator muscle. The single branches perforate this muscle to end in the mucous membrane of the cheek and in the described area of the mandibular gingiva (Fig. 9).

The anterior border of the mandibular ramus is crossed by the buccal nerve at the level of the occlusal plane. If the mouth is wide open, this plane corresponds to the occlusal surface of the upper molars. Where the nerve crosses the upper part of the retromolar fossa, it can be reached for a block anesthesia. The anterior border of the ramus and the temporal crest with the tendons of the temporal muscle attached to both bony ridges can easily be palpated, and the needle is then inserted between these ridges at the level of the upper occlusal plane. The entrance of the needle into tendinous tissue can be diagnosed by the greater pressure necessary to empty the syringe. The needle should then be retracted just sufficiently so that the injection does not encounter tissue resistance. In reaching the buccal nerve, the needle perforates mucous membrane and submucosa and the thin plate of the buccinator muscle.

It should be recognized that the plane of injection to the buccal nerve as here suggested is quite some distance above the plane for the mandibular block. This is the reason why it is wholly inadvisable to try a simultaneous block of inferior alveolar, lingual and buccal nerves.

Conclusion

Many technics for the anesthesia of the inferior alveolar nerve have been described, and there is very probably not one which is not used by some dentists and with a fairly good or good average of successes. A method can, however, not be judged only by comparing notes on successes. Not only are failures so easily forgotten but successes are often paid for with long years of trial and error. In judging a method of anesthesia, one point

should be considered earnestly: namely, whether the method is teachable. Only a method should be adopted that can be taught in exact terms and that the average student can learn so that he is sure of a successful anesthesia in those first years of practice which decide his future. —*1757 West Harrison Street.*

GENERAL ANESTHESIA FOR DENTAL PATIENTS

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WE IN THE practice of dental surgery are especially fortunate in the respect that our field of operation allows greater latitude in the choice of anesthetic agents than does that of almost any specialty of medicine and surgery.

At the Mayo Clinic the greater part of our work in dentistry requiring anesthesia is done with the patients under the influence of local anesthesia. Occasionally, however, the patient's physical condition indicates that a general anesthetic agent be used.

This paper is limited to a discussion of the use of those general anesthetic agents which we use most frequently and find serve our purposes best. There is no general anesthetic agent that combines all the good qualities one would desire in an anesthetic of this sort. The ideal agent would possess such qualities as absolute safety and complete and lasting effect. It would not interfere with vision or accessibility, would exercise some degree of control over hemorrhage and would not be unpleasant to the patient.

In choosing the general anesthetic agent to be used, the dental surgeon must consider the operative procedure as well as the patient's general condition. If the procedure is simple and likely to be of short duration and if complete muscular relaxation is not essential, nitrous oxide and oxygen or Pentothal Sodium can be used. When the procedure is more difficult and likely to require a longer period, the intratracheal administration of ether, usually combined with other anesthetic agents, produces anesthesia that is satisfactory.

Nitrous oxide gas has served the dental profession well for many years. In the beginning it was used alone as an anesthetic agent; later an admixture of air was employed. More recently, oxygen is being supplied in increasing amounts. Lundy[1] now recommends a proportion of 10 per cent oxygen to 90 per cent nitrous oxide. For relatively short procedures not requiring complete muscular relaxation, nitrous oxide and oxygen are considered to constitute a good anesthetic agent.

As an induction agent to precede the administration of agents which will produce deep anesthesia, such as ether, nitrous oxide is useful. The odor of nitrous oxide is not unpleasant, and during the early stages of anesthesia it is not so objectionable to the patient as ether. The newer types of gas machines provide a means of gradually changing from the administration of nitrous oxide to that

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1. Lundy, J. S., Personal communication to the authors.

of ether without any change in masks or other paraphernalia. Other adjuncts to the machine or the agent, such as the rebreathing bag, carbon dioxide and soda lime, also are available.

The supportive measures furnished by the trained anesthetist are of tremendous value and assistance in all surgical procedures. Many surgical risks that formerly were thought to be too great are now accepted by the surgeon. Emergencies are managed with greater ease and less confusion than previously was possible.

Pentothal Sodium also has been found to be useful for the comparatively simple procedures that are likely to be of short duration and during which complete muscular relaxation is not essential. The use of bulky equipment is largely eliminated. Since Pentothal Sodium can be introduced into a superficial vein in any of the extremities, its administration does not obstruct the field of operation, as is usually the case in the use of most general anesthetic agents. When it is used in the dilution of 2.5 per cent, as now recommended, there is adequate control of dosage.

Pentothal Sodium causes vasodilatation, which means that control of bleeding is somewhat troublesome. The patient's respiration is shallow, so supportive measures, such as a supply of oxygen and carbon dioxide, always should be available. The patient remains warm and dry and, as a rule, recovers quickly. Recovery is slower, however, than after the use of nitrous oxide; hence, more rest rooms and nursing attention are necessary postoperatively in those practices in which it is used extensively.

The use of a sharp needle and the proper technic of penetration of the vein contribute to the factors which make anesthesia with Pentothal Sodium less unpleasant to the patient. By such means, a 20 gage needle can be introduced into the patient's arm or hand almost painlessly.

Three cubic centimeters of Pentothal Sodium is administered. There is then a waiting period of a minute or so, at the end of which time 1 to 3 cc. is injected at intervals. The reaction of the patient is observed until the desired degree of anesthesia has been obtained. Continued injection tends to enhance the effect of even a fast-acting barbiturate, which means that after the patient has lost consciousness and injection has been discontinued, the stage of narcosis deepens to such a point that the respiratory center may be seriously embarrassed or respirations may stop altogether. Once an anesthetizing agent has been introduced into the blood stream, it remains there until destroyed or eliminated.

In all but the simplest procedures, the effects of Pentothal Sodium usually are enhanced by the administration of oxygen through an intrapharyngeal tube. The well lubricated tube can be introduced easily through one nostril after the patient has lost consciousness (Figs. 1 and 2). The usual signs of the various anesthetic levels are somewhat different from those when gaseous anesthetic agents are used.

Several ingenious methods in the technic of administration of the solution of Pentothal Sodium have been devised. For routine work in some dental offices an arm board has been attached to the chair. This stabilizes the arm of the patient and holds the syringe. Hubbell[2] has described an automatic dispenser which, when pressed, administers 2 cc. of solution. This dispenser has the advantage of allowing the dental surgeon to administer the anesthetic agent and to carry out the surgical procedure simultaneously. Thompson[3] has advocated injection of the operative field with procaine hydrochloride after anesthesia has been produced with Pentothal Sodium.

2. Hubbell, A. O., Intravenous Anesthesia in Dentistry. *Ann. Den.* 3:84 (December) 1944.

3. Thompson, E. C., Continuous Pentothal Sodium Analgesia, with Nerve Block, in Oral Surgery: An Analysis of One Hundred Consecutive Cases. *J. Oral Surg.* 3:205 (July) 1945.

Fig. 1.—The nasopharyngeal airway as used in conjunction with intravenous anesthesia (Adams, R. C., Intravenous Anesthesia. New York: Paul B. Hoeber, Inc., 1944)

In the operating room a length of soft rubber tubing is attached to the intravenous needle so that the position of the syringe does not interfere with the dental surgeon at the table. The needle and tubing are strapped firmly in place on the patient's arm with adhesive tape to prevent accidental dislodgment, and a metal stopcock is placed between tubing and syringe to prevent backflow between injections (Figs. 3 and 4).

It is noticeable that a combination of anesthetic agents is being used with increasing frequency. This is commonly known as "Lundy's balanced anesthesia." The combination of these agents acts synergistically in that one agent will supply qualities that are missing in another agent.

Ether is still the most widely used of the deeply relaxing general anesthetic agents in oral surgery. Although it also was used for years as an induction agent, today induction is almost always carried out by some agent more pleasant to the patient, as previously mentioned. Mest patients are repelled strongly by the sensation of choking which concentrated ether produces.

From the patient's standpoint, probably the ideal means for the production of deep anesthesia consists of a short period of induction with Pentothal Sodium, followed by the use of a mixture

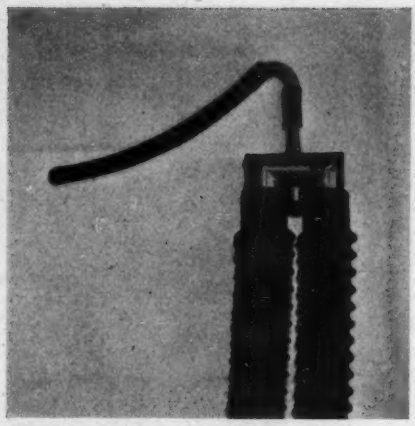

Fig. 2.—Connection of intrapharyngeal tube to the breather tubes of the gas machine (Adams, R. C., Intravenous Anesthesia. New York: Paul B. Hoeber, Inc., 1944)

of nitrous oxide and oxygen to overcome the respiratory depressant action and to induce the easy respiration necessary for intubation. This mixture is gradually replaced by an increasing concentration of ether until pure ether and oxygen remain in the system.

Pentothal Sodium is ideal as an induction agent, particularly for patients who are apprehensive or who require repeated anesthesia. Such persons frequently have a fear of the mask used in administration of an anesthetic gas and the vertigo which such an agent may produce. Pentothal Sodium alone has been used successfully for anesthesia for the introduction of an intratracheal tube. However, the relaxation of oropharyngeal musculature produced by Pentothal Sodium usually is not such as to allow sufficient opening of the vocal cords to permit nontraumatic passage of the tube into the trachea. For this reason, the Section on Anesthesiology of the Mayo Clinic still favors the employment of Pentothal Sodium combined with nitrous oxide and oxygen with ether before intubation is carried out.

One of the arts of general anesthesia is the ability to introduce ether into the mixture of nitrous oxide and oxygen as soon and as rapidly as possible in order to shorten the time of induction, and still not cause the patient to hold his breath or be seized with laryngospasm because of this more irritating agent. In the case of laryngospasm, it is almost always necessary to allow the patient to return to a lighter stage of anesthesia to overcome it, and then to begin all over again.

Use of the intratracheal tube is the method of choice in the maintenance of deep anesthesia, forming as it does a complete closed system between the lungs and the rebreathing bag on the gas machine. Since, in the use of the closed system, all expired air goes directly back to the machine and none is expired into the surrounding air, gases are kept from the surgeon and operative field, are used continuously, and a natural concentration of carbon dioxide from the lungs accumulates in the bag to stimulate continued, even breathing.

In operations about the mouth, the intratracheal tube is almost always placed through the nostril of the patient. The tube is well lubricated with white petrolatum and passed through the nasopharyngeal passage. The sound of the air stream is followed in inducing the tube to pass into the trachea. If the tube enters the esophagus, the sounds of respiration through the intratracheal tube are lost. In this event, the tube is withdrawn until the sounds are again heard and the tube is reinserted.

A well trained anesthetist has his own technic for placing the tube quickly and smoothly after removal of the mask and before the patient has taken too many breaths of fresh air and thus lightened anesthesia to the point at which the vocal cords are not relaxed. Members of the Section on Anesthesiology of the Mayo Clinic have found it most efficient to use the laryngoscope at the first sign of resistance to gentle intubation. Since this instrument is used through the patient's

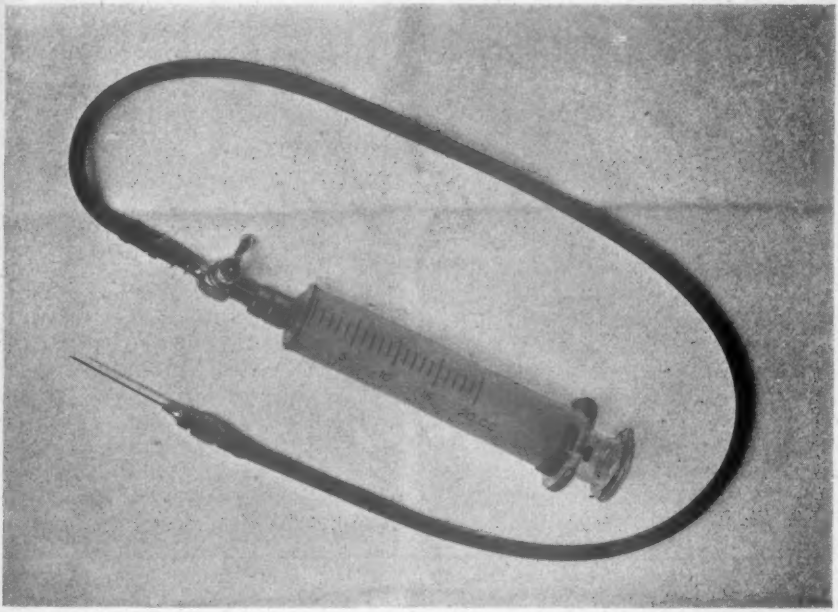

Fig. 3.—Luer-Lok syringe, stopcock, tubing and 20 gage needle for the intravenous administration of Pentothal Sodium (Adams, R. C., Intravenous Anesthesia. New York: Paul B. Hoeber, Inc., 1944)

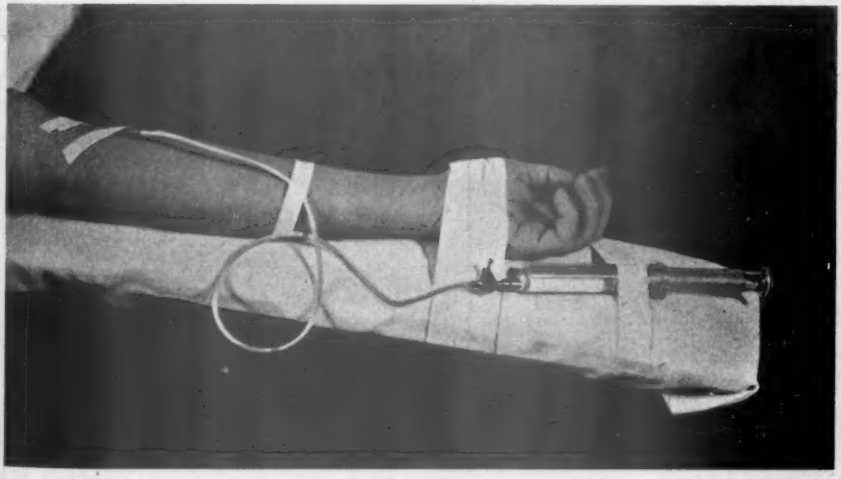

Fig. 4.—The extension apparatus in use (Adams, R. C., Intravenous Anesthesia. New York: Paul B. Hoeber, Inc., 1944)

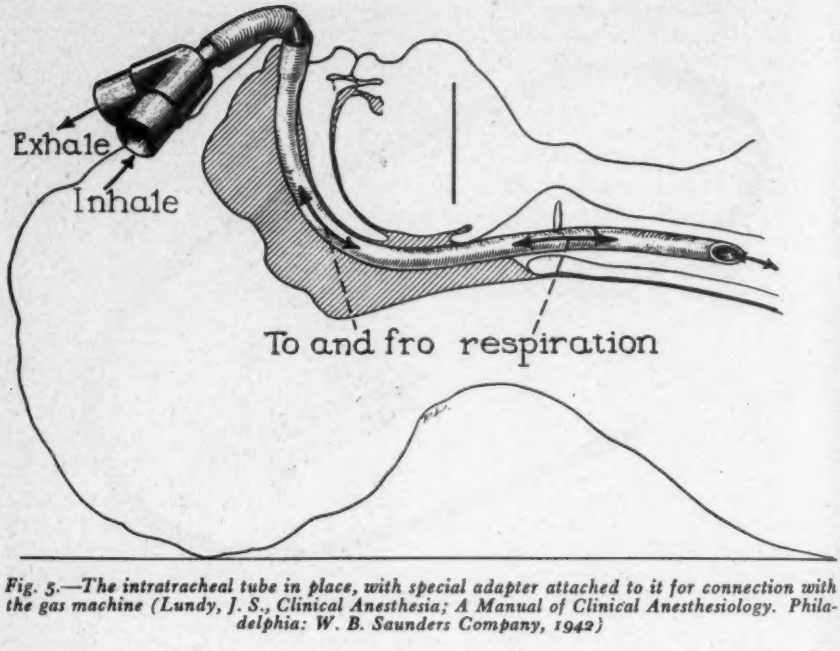

Fig. 5.—The intratracheal tube in place, with special adapter attached to it for connection with the gas machine (Lundy, J. S., Clinical Anesthesia; A Manual of Clinical Anesthesiology. Philadelphia: W. B. Saunders Company, 1942)

mouth, the point of obstruction can be seen and corrected either by rotation of the tube or assistance of the tube over the obstruction by the use of Magill forceps (Fig. 5).

In dental surgical operations, the patient's throat is always packed with gauze after intubation. This procedure serves the double purpose of minimizing the leakage of ether between vocal cords and tube, and keeping seepage and débris away from the posterior portion of the pharynx. If the intratracheal tube fits snugly and the oropharynx is packed, blood and mucus will not leak into the lungs, even during intensive oral procedures.

Dentistry as a whole has tended to minimize the value of routine examination of the heart and lungs and of urinalysis before general anesthesia is carried out. Although a dental surgeon with a lifetime of experience in general dental anesthesia learns to recognize the signs which indicate that a patient is a poor risk, a professional anesthetist would rarely proceed without a formal examination. As a matter of fact, physical examination of all patients who are to be anesthetized is carried out for the Section on Dental Surgery at the Mayo Clinic by an internist, and the results of the examination govern the manner of procedure.

GENERAL ANESTHESIA IN THE CONTROL OF PAIN IN DENTISTRY

Sidney C. Wiggin,* M.D., Boston

THE story of man's attempt to relieve the sufferings of his fellow men marks the highlights of world history. From the earliest times, man has resorted to many methods to alleviate pain. The Greeks, Romans, Egyptians and Chinese used the gases in caverns and the fumes of Indian hemp to relieve suffering. In the twelfth century, Hugo Delucca first used opium and mandragora root boiled in wine. In *Romeo and Juliet,* Shakespeare had drugs administered to Juliet to bring about unconsciousness and forgetfulness.

The real beginning of surgical anesthesia was the discovery of nitrous oxide and oxygen by Priestley in the early 1700's. In 1789, Beddoes, in England, first used inhalation therapy when he administered oxygen for the relief of cardiac and pneumonic conditions at his Medical Pneumatic Institute. The famous scientists, Faraday and Davy, who worked with Beddoes, first demonstrated the powers of ether and nitrous oxide and predicted their use in surgical procedures.

Down through modern history, for the last one hundred years, dentistry has been prominent in the progress of developments in the relief of pain. Horace Wells, a dentist in Hartford, Conn., sought something to relieve pain in the extraction of carious roots which he recognized as a chief cause of rheumatism. While attending a lecture on nitrous oxide, which was a form of entertainment for the people of his time, Wells saw a state of unconsciousness produced in a young man by the accidental breaking of a glass flask containing nitrous oxide. He at once put this observation to practical use in the extraction of teeth, and thus initiated what is even now one of the most commonly used methods of relief of pain in dentistry. By 1861, Gardner Q. Colton, another dentist, reported the successful administration of nitrous oxide to 20,000 patients for the extraction of teeth.

Working with Horace Wells in Hartford was a young dentist by the name of W. T. G. Morton. Morton became so interested in the relief of pain in dentistry that he chose to move to Boston for further experimentation in this field. Here he worked with Charles Jackson, an eccentric physician and chemist. Morton labored independently to solve the problem of relief of pain in dental extractions. Being unable to obtain nitrous oxide in Boston, he experimented with ether, using himself, his dog and even some fish as subjects.

We are gathered here to commemorate the first successful demonstration of ether anesthesia by Morton during a surgical operation, which took place in the amphitheater of the Massachusetts General Hospital one hundred years ago, on October 16, 1846. A tumor was removed from the neck of one Gilbert Abbott by John C. Warren. The demonstration was so successful that Warren

Presented at the Morton Centenary Celebration of the Massachusetts Dental Society, Boston, October 15, 1946.

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turned to those present and said, "Gentlemen, this is no humbug."

Morton's successful administration of ether as an anesthetic agent not only demonstrated that pain could be controlled in surgical operations, but, together with the discovery of the origin of bacteria by Pasteur, in 1850, and the discovery of the antiseptic treatment of wounds by Lister at this time, made possible developments in modern surgery that have saved and prolonged life. Two years after Morton's demonstration, Oliver Wendell Holmes, of Boston, gave the state of loss of feeling or sensation the name of "anesthesia," which he took from the Greek meaning "a state without feeling." Today the word signifies to us the relief of pain by the use of drugs.

Progress in Anesthesiology

From Morton's time, the developments in relief of pain were slow. In 1868, Edmund Andrews, of Chicago, first combined oxygen with nitrous oxide, and in 1881, Alexander Crombil, a British surgeon, for the first time prepared a patient for anesthesia with morphine. It was not until 1900 that atropine was added to counteract the depressing effect of morphine and to allay secretions. In 1915, George W. Crile, of Cleveland, suggested the use of scopolamine, a drug having the additional property of sedation, for the preparation of patients about to undergo a surgical procedure on the thyroid gland. This combination has proved most reliable in the preparation of the large majority of surgical patients in recent years. These were important developments in the history of general anesthesia.

A new era in anesthesia was born with the invention of the gas machine for the administration of nitrous oxide-oxygen. The first successful apparatus was made by Karl A. Connell, a New York anesthetist, in 1902. At the Boston City Hospital, in 1907, F. J. Cotton and Walter Boothby laid down the fundamental principles which, even today, are followed in the construction of anesthesia apparatus. The Cotton-Boothby gas-oxygen-ether sequence machine was the first successful one of its kind. J. T. Gwathmey, in 1912, another New York anesthetist, applied the principles of Cotton and Boothby and developed the gas machine which is now so universally used, the Foregger apparatus—the only one which delivers the gases through a water flowmeter.

About 1915, another dentist, by the name of J. A. Heidbrink, developed the first successful gas apparatus for use in the dental office. This gave great impetus to the administration of nitrous oxide to the dental patient and also to the application of nitrous oxide-oxygen analgesia in combination with the regional use of procaine hydrochloride, one of the most important developments of anesthesia in dentistry. The story of the modern developments of the gas apparatus in itself would fill a book.

Ralph M. Waters, of the University of Wisconsin Medical School, in 1926, revolutionized the use of gases and ether by the invention of the carbon dioxide absorption apparatus to remove the excess carbon dioxide from the expired gases. This consists of a canister of soda lime through which the patient breathes, enabling the anesthetist to obtain complete relaxation of the patient and the control of pain with a minimum amount of anesthetic and a maximum amount of oxygen. This was the first real attempt to place the administration of anesthetic agents for the control of pain on a physiologic basis. Waters was the first to organize the training of physicians in the hospital in the field of anesthesiology. From this time on, progress on the scientific basis of medicine, especially from the standpoint of the basic sciences of physiology and pharmacology, was rapid.

The last twenty years have demon-

strated many advances, of which the most prominent are the recognition of carbon dioxide excess and oxygen want in the patient under anesthesia and the use of artificial airways to insure patency of the air passages. The latter includes nasal catheters, oral tubes and intratracheal catheters which prevent serious obstructions of the pharynx and larynx.

An equally important advance is the adequate preoperative preparation of the patient. This includes the use of barbiturates, opiates and atropine or scopolamine to produce a basal state of anesthesia, thereby diminishing the amount of anesthetic agents necessary and allowing use of a large supply of oxygen. This combination of premedicating drugs is a *must* in the preparation of the patient for general anesthesia, but all patients require some sedation in order to get the maximum benefits from the anesthetic agents employed. The office patient who is to receive procaine hydrochloride locally with or without analgesic nitrous oxide should receive Seconal Sodium [sodium 5-allyl-5-(1-methylbutyl) barbiturate], grains 1½, and codeine, grains ½, one hour before administration of the anesthetic.

Provisions should be made for the postoperative care of all dental patients. This statement applies principally to office patients who in the past often have been neglected. Adequately trained attendants should watch the patient's recovery from anesthesia to prevent aspiration of vomitus and to afford sufficient restraint to prevent injury during any irrational state. The use of artificial respiration with oxygen will prevent respiratory depression, and the administration of circulatory stimulants and drugs will allay pain.

The postoperative care of the patient in the hospital who has undergone an oral operation is adequately carried out by following the orders of the anesthetist. To prevent pulmonary complication, the patient should be turned from side to side and given deep breathing exercises, with aspiration of secretions of the oropharynx or trachea if needed. To allay pain, Pantopon (a mixture of the hydrochlorides of alkaloids of opium), grains 1/3, should be administered every three to four hours as necessary. The patient should be watched by the nurse for hemorrhage from the site of operation. The respirations, pulse rate and blood pressure should be recorded hourly for forty-eight hours.

The use of ether has decreased since the discovery, in 1929, of the anesthetic qualities of cyclopropane, and the development of the gas apparatus with carbon dioxide absorption. The introduction of newer agents has tremendously improved general anesthesia. Pentothal Sodium [sodium 5-ethyl-5-(1-methyl-butyl) thiobarbiturate], first introduced by J. S. Lundy at the Mayo Clinic in 1936, has been a great boon as an anesthetic agent for short operations, especially those about the head and in the oral cavity. The use of the drug has been greatly developed since the war in which it proved so valuable in treatment of the wounded.

Curare, which was first used by H. R. Griffith in Montreal in 1942, is an antispasmodic drug which produces muscular relaxation, thereby necessitating only a light plane of general anesthesia with a high concentration of oxygen. Its action, which is the result of paralysis of the myoneural junction, lasts about twenty minutes. Formerly used by the South American Indians on poison arrows, it is now a valuable adjunct to general anesthesia.

In the field of dentistry, there have been many advances. It is recognized that the use of nitrous oxide with insufficient oxygen, producing hypoxemia in the patient, is no longer to be tolerated. During this last year, A. L. Barach and E. A. Rovenstine, of New York, condemned the use of nitrous oxide with insufficient oxygenation of the patient.

This is also borne out in the works of C. B. Courville, of Los Angeles, who has demonstrated the permanent pathologic changes which take place in the cells of the central nervous system from hypoxia. These workers even recommended that nitrous oxide be supplied only in tanks containing 80 per cent oxide and 20 per cent oxygen so that it never could be used with less than this amount of oxygen. They did not agree with F. W. Clement, of Toledo, who advocated the supersaturation theory of E. I. McKesson, also of Toledo. McKesson recommended the administration of 100 per cent nitrous oxide until the patient became cyanotic and then the addition of sufficient oxygen to fulfill the patient's oxygen requirement.

The Anesthetist

Let us consider some of the more important principles involved in the duties of the anesthetist in producing general anesthesia with a safe, efficient technic.

The anesthetist must be familiar with the physiology of respiration, since it is by means of the lungs that oxygen enters and carbon dioxide leaves the body and many of the anesthetic agents are absorbed and excreted. Careful observation of all phases of respiration tells more about the depth of anesthesia than all the other signs combined. With the onset of the state of anesthesia, the conscious control of respiration ceases and variations in it depend entirely on the mechanical or physiologic changes produced by the anesthetist or surgeon.

Many anatomic and other obstructions interfere with the work of the anesthetist. These include the tongue, tonsils, tumors, fluid, pus, blood or vomitus, besides the ever present danger from laryngeal or pharyngeal spasms.

Of equal importance during anesthesia is the control of the circulatory and central nervous systems, which primarily amounts to prevention of oxygen want. The cardiac patient is an example of the type of case in which the most serious circulatory complications can occur. Cerebral hypoxemia with resulting damage of cerebral cells from asphyxial doses of the anesthetic and insufficient oxygenation manifests itself in postoperative change of personality or death. For these reasons, the person administering these lethal drugs must be informed concerning all the associated phases of medical sciences and must be prepared to cope with any complication.

The cases that require exceptional skill and experience in the administration of the potent drugs for control of pain are those of an emergency nature. These include the patient who is alcoholic or in shock from hemorrhage or trauma, the patient with a full stomach or with sepsis, and the patient with respiratory obstruction from spasms of the pharynx and larynx or a foreign body.

The first principle to apply is adequate oxygenation to prevent a physiologic want of oxygen, and second, to preserve a patent airway and prevent aspiration of secretions into the respiratory tract. This requires complete cooperation among all the members of the surgical team.

Oral Surgery

The dentist of today is interested in obtaining for his patients the safest and best methods of relief of pain. Since World War I, dentists have developed the specialty of oral surgery which, together with dentistry, calls for the same care of the patient in the control of pain as other surgical procedures.

All surgical operations on the oral cavity should be performed with the patient in the Trendelenburg position to facilitate the gravitation of secretions from the mouth and to prevent aspiration into the respiratory tract. A simple device used in some hospitals is an inclined wooden stand, on which are placed

the rear wheels of the carriage on which the patient is transported to the operating room. The oral surgeon stands at the head of the patient.

The administration of the general anesthetic agent, with its many complications of induction, maintenance and postoperative results, should not be carried out in a dental office. If a patient has an oral condition necessitating a general anesthetic, he should be hospitalized. The exception is the administration of nitrous oxide-oxygen in combination with regional procaine hydrochloride by a trained anesthetist or dentist. The majority of dentists limit the induction of anesthesia in the office to the administration of procaine hydrochloride or Monocaine Hydrochloride (2-isobutylaminoethyl para-aminobenzoate hydrochloride).

Nitrous oxide-oxygen is a weak gas with a narrow margin of oxygenation. For this reason, without sufficient preoperative sedation, it is almost impossible to maintain sufficient anesthesia for even the simplest extraction without endangering the life of the patient or creating an uncontrollable situation. Consequently, when the patient is not well medicated, which is the usual situation in outpatient dental clinics, the nitrous oxide-oxygen should be reinforced with Vinethine (vinyl ether with 3.5 per cent absolute alcohol and 0.01 per cent of phenyl alphanaphthylamine). Vinethene was discovered by C. D. Leake, of the University of California, in 1931. It is a rapid acting anesthetic, faster than ether but slower than ethyl chloride. Since Vinethine damages the hepatic tissue and causes excessive salivation, it should be used cautiously for not more than one-half hour and always with a high concentration of oxygen.

Extractions of deciduous teeth in the cases of small children can be performed easily after analgesic induction of ethyl chloride just to the point of cessation of counting in cooperative patients or of crying in the uncontrolled child.

Ether used alone is probably the safest anesthetic in the hands of the inexperienced person because of its wide margin of safety and potency. Because of its drawbacks of difficult induction, unpleasantness to the patient and an incidence of nausea and vomiting, it is not the ideal anesthetic. It is also difficult with ether to maintain the proper level of anesthesia needed for long, difficult extractions with insufficient hemostasis in the mouth and lack of control of all secretions.

With proper premedication by the use of barbiturates, morphine and atropine or scopolamine, ether in combination with nitrous oxide-oxygen approaches nearer the ideal method, provided the patient is carried at the proper physiologic level by an adequately controlled supply of oxygen. Here again the technic is handicapped because of limited control over secretions. Since ether in any form is highly explosive, its use, of course, is contraindicated when cautery is employed.

Ideal anesthesia for difficult surgical procedures in the oral cavity can be accomplished only by intubation of the trachea. The direct method through the mouth is applicable only to extra-oral operations. Indirect or blind intubation through the nasal passages is ideal for intra-oral procedures.

The intratracheal catheter is connected by a special adapter to the gas apparatus with carbon dioxide absorption. If excessive secretion is anticipated as in cases of abscesses or intra-oral conditions, an inflated cuff is attached to the lower end of the intratracheal catheter. This can be inflated after the intubation by injecting air through a long, small gage rubber tube extending into the cuff from the exterior. This occludes the trachea and prevents the entrance of secretions into the lungs and the escape of gases.

Pentothal Sodium, the safest and most efficient short-acting intravenous barbiturate, is the most ideal anesthetic agent for oral surgical procedures. In combination with 50 per cent nitrous oxide-oxygen, it gives sufficient control of reflexes indefinitely. To overcome possible dangerous complications, such as laryngeal spasms and excessive secretion, certain principles must be observed.

First, the patient is premedicated with pentobarbital sodium, morphine and atropine. Laryngeal spasm is prevented by complete control of laryngeal reflexes with a 2½ per cent solution of Pentothal Sodium before any other procedure is started. A double catheter technic is employed. One nasal catheter is attached to the gas machine for nitrous oxide and oxygen administration, and another for the exchange of gases and air when the buccal cavity is packed off by the oral surgeon. The latter catheter, which is left in the nasopharynx until the patient is conscious, also provides an exit for vomitus and the aspiration of secretions during and after operation.

Since cyclopropane requires a completely closed circuit, it can be used in oral surgical procedures only with the intratracheal and carbon dioxide absorption technic. This drug is almost as potent as ether but it is less toxic. It has the great advantage of allowing 85 per cent oxygen to be used instead of 10 per cent, as in the case of nitrous oxide. Since it is effective with a high concentration of oxygen, it is especially indicated in cases of shock and pulmonary conditions. Because it is highly explosive, it is contraindicated in the presence of intense heat and cautery.

Centenary of Anesthesia

A part of the span of man's existence on earth has been reviewed briefly in an attempt to sketch the evolution of the control of pain. Starting with the most simple procedures, modern science has developed methods of relieving pain that just a decade ago were not believed possible. Morton's demonstration one hundred years ago not only showed the way to control pain but also gave rise to the modern science of anesthesiology, a landmark in the progress of human civilization. This centenary celebration of the demonstration of ether anesthesia gives us the courage and inspiration to continue the attempt to find the ideal agent and method of relief of pain in man.—*1153 Centre Street.*

Carbon 14.—Five little pea-sized amounts of an atomic bomb by-product, called radioactive carbon isotope 14, were shipped from Oak Ridge, Tenn., on August 2, first of the Manhattan District's atomic materials to be put to peaceful use. One of these particles will be used by dental scientists.

At the University of Minnesota, Dr. W. D. Armstrong will trace the deposition of radioactive carbon in inner pulp and enamel of teeth and in bone, fundamental information needed in puzzling out the reasons for good and bad teeth.—*Science News Letter, August 10, 1946, p. 83.*

SURGERY BEFORE GENERAL ANESTHESIA

Henry E. Sigerist,* M.D., Baltimore

It is a privilege and an honor to have been invited to participate in a program commemorating the centenary of anesthesia under the auspices of a Department that has made history in the field. Indeed, the year 1846 marks a turning point not only in the history of surgery but in many respects in the history of medicine at large. We all know what became of surgery after 1846, how one organ after another, one system after another became accessible to the knife. The abdominal organs, such as the appendix, gallbladder, stomach and other parts of the intestinal tract, were now attacked by the surgeon. In the course of time other organs that surgeons had never dared to touch—the kidneys, thyroid, lungs, brain and even the heart—became objects of surgical intervention. The new surgery created a different atmosphere in the hospital which, once a place of despair, now became one of hope. The accent was shifted from death to life, and if patients at last lost the fear of being operated on, it was a result primarily of the introduction of general anesthesia.

Early Surgery

There obviously was surgery before 1846, but it is hard for us to realize what these early operations were like. The best we can do in order to find out what the field and scope of surgery was before 1846 is to refer to a textbook published before that date. Going through our library, I picked at random a book that was popular in England as well as in America, *The Principles and Practices of Modern Surgery* by Robert Druitt, the American edition of which was issued at Philadelphia in 1844. The book has five hundred and sixty-eight pages, of which, characteristically enough, only seven are devoted to abdominal diseases and injuries and their treatment and only four and a half pages deal with the chest. What then were the primary objects of medical and surgical treatment in those days? Wounds including burns, fractures and dislocations, hernia, stones in the bladder, diseases of the eye, whether operative or not, and venereal diseases. Some of the general recommendations given in this book are significant. Thus we read on page 518:

> The Apparatus necessary for operations in general comprises one or more bistouries, scalpels, or other specific cutting instruments; —a dissecting forceps, a tenaculum, and small forceps (which should have a spring or catch) to take up arteries; —plenty of well-waxed ligatures, curved needles threaded, fine sponge, water both warm and cold, and wine and hartshorn in case of faintness. There should also be a sufficient number of assistants to restrain the patient's struggles, to administer cordials, to hand the different instruments to the surgeon, or to assist him in other respects, —besides a good light, and a bed or table with pillows or cushions to make the patient's position as easy as possible. . . . Moreover, the operator should always cut the skin as speedily

Presented at the ceremonies in celebration of the one hundredth anniversary of the first administration of anesthetic ether, Department of Pharmacology, University of Maryland, School of Medicine, Baltimore, October 16, 1946.

*Professor of the history of medicine, Johns Hopkins University, Baltimore.

as possible, for it is a most painful part of every operation. He should also take care to make the incision quite as long as will be required—and rather too long than too short. To pause in the middle of an operation, and cut a little more of the skin, is most awkward on the surgeon's part, and most cruel to the sufferer.

Before the introduction of general anesthesia, the surgeon was forced to perform an operation as speedily as possible. Larrey, Napoleon's great surgeon, cut off arms at the shoulder joint in less than a minute and his counterpart in the Hanover army, K. J. M. Langenbeck, was supposed to have said that the exarticulation of an arm did not take more time than it would take an onlooker to pinch up and inhale a little snuff.

We can see from Druitt's book that in 1844 the scope of surgery was still extremely limited, and when we look back to the sixteenth century and consult the works of a great Renaissance surgeon, the Frenchman, Ambroise Paré, who is often considered the father of modern surgery, we are astonished to find that he performed very much the same operations as Druitt did. And this is even true when we go still further back to late antiquity. The surgical procedures described in the book of Paul of Aegina in the seventh century A. D. are not so very different from those of Paré or even Druitt. I do not mean, however, that no progress was ever achieved from antiquity to the nineteenth century. The type of injuries changed in the course of time. War wounds changed with changing weapons, and we all know that the introduction of firearms in the fourteenth century had a considerable effect on war surgery. Operative technics were undoubtedly improved in the course of time, and in the early nineteenth century there were courageous surgeons, such as your honorary graduate, Ephraim McDowell, who without anesthesia dared to remove large tumors from the abdominal cavity. The scope of surgery, however, remained extremely limited up to the middle of the nineteenth century.

What was the cause of this limitation? Was it the lack of anesthesia, the fact that operations could not exceed a certain amount of time and could not be performed on the relaxed body? To a certain extent, yes, but not exclusively. We must also remember that the introduction of ether anesthesia was not the first attempt to render the patient insensible. From antiquity on, surgeons and physicians had endeavored to mitigate pain and to make painless operations possible. Probably the most effective ancient narcotic was a decoction of mandrake, the roots of which contain scopolamine as we know it today. Other drugs, such as opium and later also alcohol, were used for a similar purpose. Local anesthesia was produced by applying snow or ice to the skin, and in the early nineteenth century even patients in hypnosis sometimes were operated on successfully. And yet, all these methods were never generally used. Many were unreliable and some were dangerous or their effect was too short.

Why then did surgery not have its great development before the middle of the nineteenth century? Or to put the question differently: Why was general anesthesia not developed before the middle of the nineteenth century? In other words, what was the background of Morton's contribution?

We find the answer to these questions when we study the development of the concept of disease. Surgery is one method of treatment and, like other such methods, it is largely determined by the concept of disease prevailing at a given time. For over 2,000 years disease was considered the result of the disturbed balance of the cardinal humors of the body, which enjoyed health when the humors were perfectly balanced but showed symptoms of disease when this balance had been upset by a wrong mode of living, a wrong diet or some other abnormal condition.

Where such a view prevailed, the logical treatment consisted in correcting the mode of living, in prescribing a corrective diet which might be enforced with drugs. Dietetics and pharmacology provided the treatments of choice, and surgery was a last resort when all other means had failed.

Changing Concepts

From the Renaissance on, a new approach to the problems of health and disease gradually developed. In 1543, Vesalius published his *De corporis humani fabrica libri septem,* Seven Books on the Structure of the Human Body, a book that was to become the starting point of a new medical science. In the seventeenth century, anatomy became *anatomia animata,* animated anatomy, and an anatomic physiology was born when William Harvey published his discovery of the circulation of the blood in 1628. Heretofore, physiology operated with philosophic concepts such as that of the innate heat which was felt and not measured, of the humors some of which were assumed, of qualities and spirits, names for vague forces. The best physiologic theory before Harvey was the one that explained every phenomenon logically and without any gaps. With Harvey physiology became anatomic. The structure of an organ was studied in order to understand its function. No explanation was accepted as correct if it was impossible anatomically. Harvey used concepts of science, particularly of mechanics, and asked the organism questions. His method was the experimental method. Thus was born a new physiology, which was based on anatomy, used the experiment as a method of research and described phenomena not only qualitatively but also quantitatively.

In the eighteenth century a new field of medicine was conquered by the anatomic method. Pathology, the science of disease, became anatomic. In 1761, Morgagni published the results of a long life's researches in *De sedibus et causis morborum per anatomen indagatis libri quinque,* Five Books on Seats and Causes of Diseases Investigated Anatomically. Morgagni, on performing a large number of autopsies, found that organic lesions were responsible for certain diseases. It seemed obvious that if an organ was abnormal, its function would be abnormal also. What the physician called symptoms of disease appeared as the abnormal functions of injured organs. Morgagni established the method of investigation that pathology has used with so much success, the recording of all symptoms observed clinically during the course of a patient's illness and the comparison with the anatomic findings of the autopsy room. It was by following this method that pathology during the last century and a half was able to differentiate most of the cardiovascular, gastrointestinal, respiratory and many other diseases that are known to us at the present time.

As soon as physicians held the view that many diseases were characterized by their seat and that the symptoms were the result of anatomic lesions, it became the purpose of diagnostics to perceive anatomic changes on the living patient. To that end, the methods of percussion and auscultation were developed, and instruments, such as the ophthalmoscope, that permitted one to observe the anatomy of the interior of an organ, were devised. With bulbs and mirrors, the physician endeavored to look into all the cavities of the human body, and the roentgen ray was the triumph in this line of development.

From the Renaissance on, one field of medicine after another was conquered by the anatomic method, and in the early nineteenth century there was only one, namely therapy, that still had not felt the influence of this new approach. The treatment of disease followed traditional lines and still consisted chiefly of the prescription of diets and the applica-

tion of drugs which were given because experience had taught that they were effective.

When physicians began to think in terms of anatomy, their attitude toward surgery changed, and surgical procedures gradually assumed a primary position among therapeutic measures. If disease was due to anatomic changes, surgical operations could correct them directly. The surgeon by removing an abscess, an ulcer or a tumor was removing the disease and thus correcting the organ. Thus, toward the middle of the nineteenth century, the approach to the problems of disease and their treatment had changed in such a way that surgery now appeared as a primary form of treatment. Surgery, however, could not develop freely before the two bonds that enslaved the surgeon and wrecked the success of so many operations, that is, pain and infection, had been removed. In order to overcome these bonds, experiments were made with gases that promised to induce general anesthesia, namely, nitrous oxide, ether, chloroform. General anesthesia liberated the surgeon from one bond, and the other was broken when Lister introduced the method of antisepsis which was gradually developed into asepsis. Surgery now was free to develop along the line that western medicine had taken ever since the Renaissance.

Today, on October 16, 1946, in reverence and with gratitude we remember the men who, one hundred years ago, met in Boston and had the imagination and courage to perform the crucial test and the wisdom to recognize its full significance for the future.—*710 North Washington Street.*

WILLIAM T. G. MORTON AND ETHER

J. Ben Robinson,* D.D.S., Baltimore

Prior facts and discoveries are essential to the success of the productive investigator. A review of the contributions of great discoverers indicates that success in enterprise is achieved largely by exploiting the experiences of students and observers who have contributed new knowledge and by extending and applying specific experimental gains that have been made by other workers in the same area of investigation. It is not too much to say that all scientific discovery of lasting value to society has stemmed from preliminary investigation and experiment of a useful, contributory character.

The discovery of anesthesia followed such a pattern. The long road which led finally to the conquest over pain began with man's first clear conception of the meanings of pain and death. These two enemies of man have been inseparable terrors of the human race, and throughout history man has sought diligently, feverishly, frantically to control the one and postpone the other. These primitive efforts, plus the related work of the pure scientist, laid the groundwork for ultimate success in achieving complete control over physical pain.

*Dean, Baltimore College of Dental Surgery, University of Maryland.

Presented at the ceremonies in celebration of the one hundredth anniversary of the first administration of anesthetic ether, Department of Pharmacology, University of Maryland, School of Medicine, Baltimore, October 16, 1946.

Early Methods of Anesthesia

Among many early civilizations, crude means were used for reducing the degree of physical pain to which the patient was exposed when subjected to operative procedures. The literatures of many early civilizations include references to the use of sleep-producing potions and early medical writings refer to various drugs which were employed by the physician to reduce or prevent physical suffering. However, the use of none of these agents persisted to any degree beyond the opening of the nineteenth century.

The true foundation for the discovery of anesthesia was laid in experimental chemistry. The tremendous activity and advancement in chemistry in the latter part of the eighteenth and the early part of the nineteenth centuries opened up inviting avenues of scientific advancement in many directions, including the applications of new discoveries to the medical services. In 1799, Sir Humphry Davy demonstrated the stupefying properties of nitrous oxide and suggested the possibility of its successful application as an aid to surgery; and in 1818, Michael Faraday discovered the anesthetic properties of chemical ether. In view of the positive knowledge concerning the anesthetic properties of those agents contributed by both Davy and Faraday it seems strange that some resourceful surgeon did not experiment with them as useful aids in surgery. The demonstration of their values to mankind remained to chance and to casual observation.

Both nitrous oxide gas and chemical ether possess the property of producing excitement and exhilaration in those subjected to their use. For many years they were used extensively for their intoxicating effects. Ether parties and nitrous oxide entertainments were among the most popular social events of the times. Out of this aspect of the use of these beneficent agents came many contributions of value to the final discovery of anesthesia.

Wells's Observation

In December 1844, Horace Wells attended an exhibition at which the stimulating effects of nitrous oxide gas were demonstrated. It is a familiar story. During the performance, one of the participants injured himself in a manner that normally would have caused him extensive pain; but when questioned he declared he felt no ill effects whatever. Wells observed this phenomenon and at once concluded that, in addition to its exhilarating effects, nitrous oxide possessed also a property that would deaden pain caused by trauma. Realizing the vast possibilities of this agent, if his deduction was correct, Wells decided to experiment with it in the hope and expectation that it could be used to control pain in oral surgery. Therefore, he arranged at once for an experiment, with himself as the subject, in which he took nitrous oxide gas for the purpose of having one of his teeth extracted. The tooth was removed without any pain to the patient. The experiment was successful and the results of this epoch-making incident were immediately announced to the public.

Early Use of Nitrous Oxide

After the experiment on himself, Wells employed the gas extensively in his private practice in order to test its reliability and to determine the extent of its usefulness. These subsequent experiences with the new and magical agent were highly successful and convinced the discoverer of its unlimited possibilities in the field of surgery. With these experiences for background and with his faith established in the future value to mankind of his discovery, Wells soon went to Boston in order to make his technic known to the medical profession in that city. This visit held both great and ominous possibilities for the discoverer. Upon his arrival in Boston he called on a former friend, the distinguished chemist, Charles Thomas Jackson, and conferred with

a former associate, William T. G. Morton. He conferred also with J. C. Warren and C. F. Hayward, to whom he explained his discovery. As a result of these conferences, Warren invited Wells to lecture before his medical class at Harvard and later arranged for him to demonstrate his method of controlling pain, a demonstration which, it will be recalled, was only partially successful. Despite his failure to achieve complete success, to Horace Wells belongs the honor for the discovery of surgical anesthesia. It is not contended that he discovered the anesthetic properties of nitrous oxide gas. However, it is contended that he observed the state of insensibility to physical pain which resulted from its inhalation; that he recognized that the physical state produced by the inhalation of the gas differed from the ordinary condition of intoxication; and that he was the first to demonstrate that complete anesthesia of adequate duration for surgical operations could be secured.

The First Demonstration

While Wells's demonstration of anesthesia before the class at the Harvard Medical School was not a success in the full sense of the word, his conferences with friends in Boston and his lectures and demonstrations at Harvard were conducted in a sphere of interest and activity out of which finally came, under the most auspicious circumstances and with complete success, the use of ether as an aid to surgery.

Morton's Background and Training

To William T. G. Morton belong the honor and the credit for introducing sulfuric ether as an effective anesthetizing agent in cases requiring surgical intervention. Fate seems to have assigned him to a set of circumstances in which he was exposed to all the factors relating to the current status of anesthesia, and nature had provided him with those essential qualities of mind and heart that led him inevitably to exploit these factors in the interest of humanity.

Morton lived and practiced dentistry in Boston in close association with some of the leading medical authorities of the day. He knew many of them personally and commanded their highest respect. In addition, his professional education was gained in close relationship with those who had gone far toward perfecting the practical use of surgical anesthesia.

Morton began the study of dentistry under the tutelage of Horace Wells and, for a short period of time, was associated with him in a partnership dental practice in Boston. Later, Morton visited Wells a number of times at Hartford, notably in July 1845, when he conferred with him concerning the methods of manufacture and the technic of administration of nitrous oxide gas. He studied medicine in the office of Charles Thomas Jackson, a chemist of unusual ability, who had experimented with the exhilarating and anesthetic properties of sulfuric ether, as Faraday had done thirty years earlier. Morton matriculated at the Harvard Medical School in 1844 and attended a few lectures. Incidentally, it has been said by an enthusiastic biographer that Morton graduated from the Baltimore College of Dental Surgery. This claim for him is in error.[1]

We will not controvert the statement that "during the next eighteen months he diligently pursued the study of his profession," but we deny that the few weeks spent in Baltimore were devoted to the systematic study of his profession. He was never so much as a matriculant of the College of Dental Surgery, far less did he graduate.

Experimental Approach

In his introduction of ether as an aid in operative procedures, Morton conformed to the pattern followed by others in the advancement of scientific dis-

1. Harris, Chapin A., Editorial. Am. J. D. Sc., New Series, 9:292 (April) 1859.

Another portrait of W. T. G. Morton

covery. He drew upon the fact that surgical anesthesia was a reality, upon the successful experiments of others with nitrous oxide gas and upon the scientific findings of the chemist that the physiologic effects of ether resemble closely those of nitrous oxide. With these resources at his disposal he called upon his own courage, foresight and genius to fashion a method destined to give to humanity sure relief from the horror and pain of operations. The fact that Morton depended on prior knowledge and earlier successful experiments to reach his objective does not take any credit from the great discoverer who deliberately, purposefully and courageously translated the findings of others into a highly useful and beneficent instrument of mercy and service.

It is a notable fact that Morton approached his task by way of the experimental method. Whereas Wells subjected himself directly to experiment in order to test his assumption, Morton began by experimenting on animals in order to determine the action of the particular agent on the living organism. Having by this method proved both the efficacy and safety of sulfuric ether in producing anesthesia, he applied it to use in surgical procedures. On September 30, 1846, he administered ether to a patient for the purpose of extracting a difficult tooth. Subsequently, he made other tests; and finally, on October 16,

1846, Morton administered ether vapor to a patient in the Massachusetts General Hospital in preparation for an operation. The patient manifested no signs of pain, and on October 17 the experiment was repeated with equally favorable results. As a consequence of these successful tests, Morton was proclaimed by the medical profession and the people of Boston as the discoverer of anesthesia.

Reaction to Success

When Morton's experiment with ether proved successful he claimed the discovery of a new agent that would produce anesthesia; he tried to hide its identity from everyone, including J. C. Warren, the surgeon, and he proceeded promptly to patent the agent under the trade name, Letheon. However, when the true nature of the agent became known, Morton conceded that he had received assistance in his experiments with ether vapor from Jackson and freely agreed to share with him the honor and emoluments accruing from the discovery. From this point he went on striving desperately to secure financial returns from his discovery.

The subsequent experiences of Morton in his regrettable attempt to commercialize his services to mankind were most embarrassing to his friends and to the professions. In the beginning of the famous ether controversy the contention was purely with respect to the discovery of ether as an anesthetizing agent. Both Morton and Jackson were aware of Wells's successful experience in using nitrous oxide gas to produce anesthesia; but strangely enough, both contended that it could not achieve the results claimed for it. On these grounds they claimed to be the discoverers not only of ether anesthesia but of the principle of surgical anesthesia.

There can be no doubt of Morton's right to the claim that he was the first to administer ether for the definite purpose of producing complete insensibility to physical pain and that the popularization of surgical anesthesia and its worldwide acceptance by science and medicine stemmed from his successful demonstration at the Massachusetts General Hospital. And there can be no question of the fact that from his determined, courageous efforts to convince the world of the safety and efficacy of an agent that he had tested and found effective in producing complete insensibility to pain, came directly one of the greatest blessings that has ever been conferred on the human race. Any subsequent errors of judgment on his part with respect to material rewards and benefits should be forgotten or looked upon with pity in the light of the positive values of the rich contribution he made to humanity.—*42 South Greene Street.*

Support for Dental Education.—Dental education has always demonstrated peculiar strengths and weaknesses. Its chief strength has been the relentless determination of its leaders to maintain the highest possible standards in the quality of instruction and in the quality of its product; its greatest weakness has been the fact that dental education, by and large, has had to be self-supporting. From the beginning it has lacked either suitable endowments or adequate income from public funds to maintain those qualities of instruction and reasearch which are so essential to the fullest achievements of dental health care.—*Dentistry: An Agency of Health Service. Malcolm W. Carr. New York: Commonwealth Fund, 1946, p. 10.*

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EDITORIALS

SURGICAL ANESTHESIA, 1846-1946: THE MORTON CENTENNIAL CELEBRATION

AT THE close of a war that brought intense suffering to millions of people, there is a special kind of relevancy in commemorating the centennial of the first public demonstration of ether anesthesia. The paradox of men working ceaselessly toward the control of pain and of men perversely creating pain through war is obvious. But even in war, the power of anesthetic agents in controlling pain could almost match the power of guns and bombs in creating it. The dramatic qualities of the first demonstration are amply rehearsed in this special issue of THE JOURNAL, which presents, in addition to a historical review, articles on modern anesthetic agents and technics.

Those who have attempted to recreate pictorially the memorable scene of the first public demonstration in the amphitheater of the Massachusetts General Hospital differ in their visualization of it, but the central figure is always William Thomas Green Morton, dentist. Always shown is the bank of spectators, some of whom seem almost casual in witnessing an epochal moment of history: J. C. Warren, the surgeon, who poses his scalpel over the tumor on the neck of "Gilbert Abbott, aged twenty-five, single, painter"; the visiting medical men—Bigelow, Gould, J. Mason Warren, Parkman, Hayward and Townsend—whose natural skepticism must soon have been replaced by a dim realization of what they had seen. But this setting would mean nothing were it not for the central figure—Morton—and the hollow glass which contained ether. Because of his courage on that day, Morton will continue to stand for all time as one of the central figures of that little group of men whose vision and search gave anesthesia to mankind.

The celebration of the first centennial of the public demonstration of ether has been nation-wide. On October 16, the actual anniversary of the demonstration,

an appropriate ceremony was conducted in Boston under the direction of the Morton Centennial Celebration Committee of the American Dental Association. This committee, of which Kurt H. Thoma was chairman, successfully brought to the attention of the public that dentistry, even in its earliest days as a profession, had the major role in bringing anesthesia to reality and use. Just as important, perhaps, was the committee's work in showing that the dental profession has kept faith with that early promise by working unremittingly to bring to more people the comfort and happiness that accompany improved dental health.

THE 87TH ANNUAL MEETING OF THE AMERICAN DENTAL ASSOCIATION

The first postwar meeting of the House of Delegates of the American Dental Association was held in Miami in October, and a number of important actions were taken.[1] Full delegations were in attendance from almost all of the states and participated in a discussion of the many problems which confronted the highest body in American dentistry. This was the first meeting of the Association ever held in the Fifth District, and the hospitality of the Florida State Dental Society, the East Coast District Dental Society and the Miami Dental Society was both traditional and cordial. The efficient arrangements which contributed so much to the success of the meeting were under the direction of a group of local committees headed by: E. B. Penn, Horace L. Cartee, C. W. Swords, T. C. Henslee, J. Murray Cox, S. G. Alderman, George M. Shields and Mrs. J. Murray Cox. The House of Delegates very properly recognized the efforts of E. B. Penn, chairman of the Committee on Local Arrangements, by electing him to the office of First Vice-President.

President Walter H. Scherer, who had the unusual opportunity of serving two terms because of wartime conditions, was succeeded by Sterling V. Mead, whose enthusiasm and vigor promise a stimulating administration. In addition to Dr. Penn, the House of Delegates recognized, by election as Vice-Presidents, M. D. Huff, chairman of the Research Commission, and B. B. McCollum, Los Angeles, who has made many distinguished contributions to dental science. The retiring General Secretary, Harry B. Pinney, was given an ovation by the House which attested to its appreciation of his many years of loyal service. Roscoe H. Volland was again elected to the office of Treasurer. H. B. Washburn, who will succeed to the presidency in 1947, was named President-Elect.

In addition to its consideration of a revision of the Association's Constitutional and Administrative By-Laws, which is discussed elsewhere in this issue, the House of Delegates reaffirmed its opposition to a system of compulsory health insurance as proposed by the Wagner-Murray-Dingell bill; voted for the addition of one dollar to the annual dues, this sum to be earmarked for the Relief Fund; requested proper dental representation in the World Health Organization; approved the employment of the dental hygienist as an ancillary aid to the dentist and urged that adequate

1. For a discussion of activities of the meeting, see *J.A.D.A.* 33:1444 (November 1) 1946 and *J.A.D.A.* 33:1493 (November 15) 1946.

training courses and facilities be established for dental hygienists; opposed the establishment of a "means test" at the federal level for a program of dental care, holding that the desirability of such a test should be determined at the state level; and established a branch office of the Association in Washington, D. C.

The House of Delegates also approved a retirement income plan for employees in the Central Office of the Association; authorized the fortnightly publication of regular issues of THE JOURNAL; authorized the establishment of a Conference of Dental Editors within the American Dental Association; endorsed the provisions of legislation to provide more efficient dental care to personnel of the U. S. Army; and asked for an immediate Congressional investigation of the exceedingly unsatisfactory program for the disposal of surplus property to dental veterans.

This brief summary of work concluded by the House of Delegates indicates renewed interest in many activities postponed or delayed by the war and also points the way for expanding present services to members.

Full peacetime activities will be resumed by the Association at once, and plans are already being completed for the first postwar scientific meeting which will be held in Boston in August 1947. This meeting will be held in connection with the Tenth International Dental Congress, and American dentistry will have the opportunity of focusing national and international attention upon dental science, needs and programs.

THIRD ANNUAL CONGRESS ON DENTAL EDUCATION AND LICENSURE

THE Council on Dental Education of the American Dental Association has announced its plans to conduct a Third Congress on Dental Education and Licensure in connection with the Midwinter Meeting of the Chicago Dental Society on Saturday, February 8, 1947. Congresses were held in 1941 and 1942 but were discontinued on account of the war.

The basic purpose of the Council on Dental Education in promoting the Congress is to bring about closer relations between teaching in the dental schools and examining by the state boards. The accomplishment of this purpose is highly desirable from every viewpoint. A dynamic dental curriculum must be flexible, adapted to the growing body of dental science and to the constantly widening range and extent of dental services. The examining processes, in turn, must also be flexible enough to keep abreast of progressive teaching and research. The Council has done a distinct service to dental education and licensure by insisting that each of these social agencies—teaching and examining—should be aware of the functions and accomplishments of the other.

The hearty participation in the Congress of the American Association of Dental Schools and of the American Association of Dental Examiners is symbolic of the leadership which the Council, as an agency of the American Dental Association, is exercising in this important field.

ANNUAL CHRISTMAS SEAL CAMPAIGN CONDUCTED FOR A.D.A. RELIEF FUND

For the past ten years the Relief Fund of the American Dental Association and the state relief funds have granted more than twenty thousand dollars annually to needy dentists and their dependents. Last year forty-five grants were made for a total of $25,678 from the two funds. This valuable protection against disastrous circumstances, such as prolonged ill health, is one of the most valuable features of membership in the American Dental Association.

The Relief Fund, which presently amounts to $624,788.22, is largely supported by the annual Christmas Seal campaign which has been carried on since 1913. The income from this source for last year was $46,407.21, a decrease of $3,317.54 from the preceding year. One-half of this income from the Christmas Seal campaign is returned to the state dental societies to be used for their portion of the relief payments; the other half is paid into the Relief Fund. The principal of the Relief Fund is not available for benefit payments, as only the interest is used for that purpose.

The Christmas Seal campaign for 1946 is now under way. Such a worthy project demands personal interest from every member.

REVISION OF CONSTITUTIONAL AND ADMINISTRATIVE BY-LAWS

A complete revision of the Constitutional and Administrative By-Laws of the American Dental Association was presented to the House of Delegates at the recent meeting in Miami. The revision was originally prepared by a special committee of the Board of Trustees composed of H. B. Washburn, C. J. Wright and Harold W. Oppice, chairman. The Board of Trustees, after a full discussion of the policies and administrative assignments involved, referred the instrument to the House of Delegates with its approval. In the House of Delegates the revision was sent to the Committee on Constitutional and Administrative By-Laws for the year's study which is necessary before a final vote can be taken.

The text of the new instrument was made available to all members of the House of Delegates and, in addition, will be printed in full in a forthcoming issue of The Journal. Because of the importance which a revision of the basic articles of an organization has for all members, it is urged that each constituent and component dental society devote as much time as is needed, at a regular or special meeting, to an analysis of the revised Constitutional and Administrative By-Laws. Any suggestions growing out of such discussion should be sent immediately to Percy T. Phillips, 18 East Forty-Eighth St., New York 17, chairman of the Committee on Constitutional and Administrative By-Laws.

COUNCIL ON DENTAL HEALTH

DENTAL PROGRAM UNDER HEALTH INSURANCE OUTLINED IN REPORT OF SOCIAL SECURITY BOARD

THE Bureau of Research and Statistics of the Social Security Board has released its report on *Medical Care Insurance: A Social Insurance Program for Personal Health Services.*[1] The report contains a comprehensive analysis of the health needs and the resources for providing health services in this country. The primary aim of the authors apparently was to develop arguments favoring the establishment of a compulsory national insurance system.

It is of special significance to the dental profession that fourteen pages of the printed report are devoted to the need for dental care, dental personnel and service capacity, cost estimates for dental care and a theoretical application of a compulsory insurance plan in providing initial and maintenance dental care for adults and children.

The factual information presented in the chapter on dental care is familiar to the readers of dental literature. Of the twenty-three references to data on the dental health problem, fourteen were taken from the pages of THE JOURNAL or from testimony offered during Congressional committee hearings, also published in THE JOURNAL.

For a considerable number of years various committees of the American Dental Association have conducted intensive studies of the same data recently analyzed by the Bureau of Research and Statistics of the Social Security Board. As a result of these studies, the American Dental Association has adopted principles which in its opinion must form the basis for attacking the dental disease problem in this country. The American Dental Association has concluded that its proposals for attacking the problem offer greater benefits to the public than would be possible under a compulsory national insurance plan. The authors of the current report on *Medical Care Insurance* apparently have reached an opposite conclusion.

The dental profession has always demonstrated a willingness to study the opinions of other groups interested in the promotion of dental health. The latest report on dental care under a compulsory insurance system, therefore, will be given the same careful scrutiny that previous reports on this subject have received. Because the report of the Social Security Board will not in all probability be distributed widely among the members of the dental profession, the chapter on dental care is reprinted here in order that they may be informed of the recent proposals of the Social Security Board.

President Truman, message to the Congress, November 19, 1945:

"Such a system of prepayment should . . .

1. *Medical Care Insurance: A Social Insurance Program for Personal Health Services.* Report from the Bureau of Research and Statistics, Social Security Board, to the Committee on Education and Labor, United States Senate. Washington: United States Government Printing Office, 1946.

also cover dental care—as fully and for as many of the population as the available professional personnel and the financial resources of the system permit."

Dental care is an essential part of adequate medical care. Unfortunately, the provision of comprehensive dental care, through the health insurance system or otherwise, presents some problems that cannot be solved at once. The total need for dental services of all types is much larger than the available professional personnel can possibly meet. This will be evident from even a cursory inspection of the facts. But since diseases and defects of the teeth and related tissues are the commonest ailments and afflictions of man, since their prevention, correction, and treatment are very important for general health, and since dental care involves burdensome costs that lend themselves to insurance protection, the insurance system should provide such dental benefits as it can.

If comprehensive dental benefits cannot be provided at the outset, the practical questions are these: How shall limited dental benefits be defined? Which benefits can and should be provided at the outset? What can be done to aid and encourage the education and training of the personnel needed for more extensive services? Which benefits shall be added as personnel becomes available in the course of time?

Amount of Dental Care Needed

Even though the people of the United States may have been receiving on the average as much dental care as the people of any other nation, and perhaps more than most, they have been receiving only a fraction of the care they need. Extensive surveys have indicated that each year only about one-fifth, one-fourth, or possibly one-third of the dental care needed—according to various widely accepted standards—is actually received. Dental neglect and inadequacy of care have been the prevalent condition throughout the lifetime of most of the people who now constitute our population. As a result, there is a vast amount of dental disease and defects, a large reservoir of accumulated dental neglect. In addition, some new dental diseases or defects appear among most people every year, among those who do and among those who do not have neglected conditions carried over from prior years. The design of a program for dental care must therefore reckon with (*a*) accumulated neglect from the past, and (*b*) each year, with the year's need for preventive services to preserve dental health, and (*c*) with the year's new crop of dental diseases and defects. The total need for service is far beyond the capacity of our resources for dental care.

The magnitude of needed dental care was illustrated by the results of Selective Service examinations. During the first year that Selective Service was in operation, dental defects outranked all other recorded defects and accounted for 21 per cent of the first 900,000 rejections. Later, dental requirements were modified and practically all standards of dental health were eliminated as reasons for accepting or rejecting an individual for military service—except for such conditions as severe jaw malformation or malignant growths. The average dental-care need for each 100 inductees was found to be about 60 to 80 extractions and a minimum of 240 fillings. The Army undertook to provide needed dental care—for both accumulated neglect and currently developing conditions. Between Pearl Harbor day and the end of September 1945, the Army Dental Corps had provided, in addition to other services, 71,500,000 fillings, 16,500,000 extractions, and 2,600,000 dentures for the Army personnel.[1] Presumably, these services went a long way—though not the whole way—toward providing needed dental care.

The results of Selective Service examinations apply to a narrow age-group in the population. Although information regarding needed dental care in the whole population is somewhat fragmentary, the available data indicate that the existing need is about as follows:[2]

	Per 100 persons
Extractions	190
Fillings	500
Prophylaxis	100
Examinations	100
Crowns and bridges	20
Dentures	20

1. Records of Army Dentists Reported by Dental Division. *J.A.D.A.* 32:1469-1470 (December 1) 1945.

2. Parran, Thomas, *Dental Research and Dental Care.* Hearings Before a Subcommittee of the Senate Committee on Education and Labor on S. 190 and S. 1099, 79th Cong., 1st sess., June 26-28, 1945, pp. 17-24.

These figures include both the results of prior neglect and currently developing needs.

What these figures mean in terms of dental personnel may be illustrated by a few simple calculations. Assigning to each type of service a reasonable allowance for working time, the aggregate for the nation is about 800,000,000 hours of dental work. A dentist working on patients forty hours a week, fifty weeks a year, would be able to provide 2,000 hours of service. At this rate, the services of 400,000 dentists would be required for one year to eliminate accumulated needs and place the entire population of the country in such condition of dental health that it would require only maintenance care each year thereafter. As against any such figure as 400,000 dentists, the United States had about 70,000 active dentists in 1940. At the present time the number is estimated to be between 70,000 and 76,000.[3]

Dental Personnel and Service Capacity

The operation of even an adequate maintenance and control program, to provide services only for new needs that arise each year, may at this time be beyond the service capacity of the nation's dental personnel, or it might require most of the available resources. At a maximum of 2,000 hours of service a year, 70,000 dentists would have a work capacity of 140,000,000 hours of service. Considering the fact that about 5,000 of these dentists are over 65 years of age,[4] this is a high estimate of available dental time.

If the population of 140,000,000 persons called for at least maintenance service each year, amounting on the average to one hour per capita, this would require just about the total dental man-hours available. If two hours per capita on the average were required, present resources would be about one-half of that needed. If, alternatively, the same rates were applied to only about one-half the population, one-half the resources would be needed —at the rate of one hour per person, and all of the resources—at the rate of two hours per person. However tentative and approximate such calculations may be, they indicate the likelihood that even total maintenance care may not be feasible with present personnel. In any case, such an approach is unrealistic because a national program for dental care could not undertake maintenance care while ignoring accumulated dental neglect in the mouths of the same people.

A more practical approach is to evaluate total service-capacity against a reasonable index of actual current utilization of, or effective demand for, service—as distinguished from estimated total or true need for service.

The amount of dental care that people receive varies with their income level; the poor receive least per capita and the rich most. Both extremes may be avoided in selecting a practical—as distinguished from a theoretical—index of a desirable level of care. In a recent study of dental needs versus dental manpower, if the entire adult white population of the country in 1940 received dental services similar to those actually received by white persons, canvassed during 1928-31, whose family income was $5,000 a year and over, and if children received needed fillings only, the dentist-hours required for the services specified would be as in Table 8.[5]

To these 136,000,000 service-hours would have to be added the annual dentist time required to care for: the annual needs of children under 6 years of age; the annual needs of children (from 6 to 20 years of age) for services other than fillings—services such as examinations, orthodontia, extractions, and oral surgical treatments; the annual need among adults for treatment of periodontal

Table 8.—An estimate of dentist-hours

[Based on services received by white persons in families with annual incomes of $5,000 and over]

White population and service	Dentist-hours (in millions)
Total	136
77,000,000 adults:	
Fillings	53
Extractions	13
Crowns and bridges	16
Dentures	4
Prophylaxis	28
33,000,000 children (6-20 years of age), fillings	22

3. Morrey, Lon W., Dental Personnel. *J.A.D.A.* 32:131-144 (February 1) 1945. O'Rourke, J. T., An Analysis of the Number and Distribution of Active Dentists in the United States. *J.A.D.A.* 31:1097-1110 (August 1) 1944.

4. Klein, Henry, Dental Needs Versus Dental Manpower. *J.A.D.A.* 31:263-266 (February 1) 1944.

5. Ibid., pp. 263-266.

diseases and for correction of conditions requiring surgery; and the annual needs of the non-white population (they were not covered in the study from which the data are derived). It may therefore be estimated that the total annual effective demand of the population as a whole—mainly at the level of care actually being received over ten years ago by white families in the income levels $5,000 and over—requires at least double the dental manpower now available, or about 140,000. These figures assume 2,000 man-hours a year per dentist. Since about 1,700 is probably a more reliable index, a more conservative estimate of dentists required for a comprehensive program is about 165,000.

These and the preceding estimates, indicating the shortage of dentists to furnish all needed dental care, paint the picture blacker than it needs to be. They assign all the needed work to dentists. We shall see later that some of the work can be done by dental assistants, so that the shortage of dentists may be reduced.

The present geographical maldistribution of available dental manpower further complicates the problem of planning a dental program for national health insurance. For the entire country in 1940, the ratio of dentists to population was 1 per 1,870. But the ratio varied greatly among the several states and the District of Columbia,[6] as follows:

Number of States:	*Persons per dentist*
3	5,000 or more
3	4,000-5,000
8	3,000-4,000
13	2,000-3,000
22	1,000-2,000

The influence of the economic status of the community on the distribution of dentists is shown by the fact that in counties where the average per capita expendable income was less than $100, there were on the average more than 11,000 persons per dentist. There were more than 1,000,000 persons in these counties and they had 109 dentists to care for their needs. Counties where the average per capita expendable income was $600 or more, and where one-half the population and 69 per cent of the dentists resided, had only 1,300 persons per dentist.[7]

The number and distribution of dentists was reviewed in 1944 by the Institute on Dental Health Economics, University of Michigan. The committee of the Institute on availability of dental services carefully considered studies made by Dr. J. T. O'Rourke and others and concluded that the unequal distribution of dentists bore little relation to the reported variation in the incidence of dental diseases. It appeared to the committee that dentists do not choose to locate in certain sections either because of inadequate facilities or because of inadequate local income. It was noted that in the Middle Atlantic region 27 per cent of the total dentists served 21 per cent of the population of the United States, while by contrast in the East South Central region 4 per cent of the total dentists served 8 per cent of the population. More serious variations occurred within state borders when rural and urban populations were compared.[8]

With regard to the Negro population, the lack of dental personnel is even more serious than for the population as a whole.[9]

The maldistribution of dentists, geographically, would no doubt be greatly moderated when the insurance system increases the ability of many communities and of low-income groups to pay for dental services. Without an insurance system—or an equivalent for prepayment—the maldistribution promises to continue or even get worse. The results of a questionnaire study directed to all dentists serving in the armed forces in 1944, indicated that nine-tenths of the men reporting intended to enter private practice upon release from service. While most of them were planning to return to their former communities, significant numbers expressed the intention of moving to states where there are already more dentists per 1,000 of the population than in the country as a whole. The study revealed a definite further trend away from rural areas, although one-fourth of the reporting group stated that they would establish practice in poorer areas

6. Bureau of the Census, *Sixteenth Census of the United States, 1940*. Series P-11, No. 1-49; Population (second series), Characteristics of the Population, United States Summary.

7. Parran, op. cit., p. 22.

8. School of Public Health, University of Michigan, Ann Arbor, Mich., *Committee Reports of the Institute on Dental Health Economics, June 26 through July 1, 1944*, p. 8.

9. Dixon, Russell A., *Dental Research and Dental Care*. Hearings Before a Subcommittee of the Senate Committee on Education and Labor on S. 190 and S. 1099, 79th Cong., 1st sess., June 26-28, 1945, p. 38.

needing dentists if some form of subsidy or loan were provided.[10]

This brief review of dental service needs and of available personnel may be sufficient to indicate that a comprehensive or complete program of dental care—for the entire population or for most of it—is impractical now. Substituting the effective or actual demand for service observed among persons in moderately high income levels (families with $5,000 or more in 1928-31) for the estimated total need, substantially lowers the expected volume of dental service. But even this implies a program that is far beyond the service capacity of the available personnel.

While this general conclusion is undoubtedly valid, it is difficult to estimate reliably by how much the available service capacity is deficient. The principal element of uncertainty is the estimate of how much the demand for dental care will increase when the economic barriers are removed through inauguration of an insurance system. Some think that demand would increase enormously. Others doubt this; they think that a moderate increase would appear at once, and that further increases would develop slowly, over a period of years. There is no disagreement that the cost of dental care has discouraged many from receiving needed care; but there are serious differences of opinion as to the relative importance of the cost factor as against other reasons for inadequate dental care—indifference, ignorance of the importance of dental care and fear of dental treatment. The experience derived from various experiments in providing dental care without costs or with only limited charges, and with organized provision for dental health education, etc., is not sufficient to resolve these differences of opinion. The design of dental benefits under health insurance must therefore proceed cautiously; it must consider the provision of limited services that can quite surely be provided, and leave the door open to expansion of the benefits as experience indicates that this becomes practical.

A broad or national program for dental health in the immediate future should therefore include: (1) an expanded program of dental research, to increase our knowledge of the causes of dental diseases and defects, and of effective methods of prevention and treatment; (2) the training of additional needed personnel—dentists and auxiliary personnel, and more efficient use of their service capacity; (3) a strengthened program of dental-health education of the public; and (4) careful design of a limited program of dental services, calculated to make the best possible use of available resources and to allow for later expansion.

While the principal activities of an insurance program will center around the actual provision of services, this should be coordinated with the programs for research, personnel training, and health education of the public.

Some Relations Between Research and the Training of Personnel

The rapidity with which the limited dental services provided under a national health insurance program can be extended will depend largely upon what provisions are made for dental research and for the increase of dental and auxiliary personnel. The need for expansion of dental research has been strongly urged by the American Dental Association and other professional organizations. Federal legislation to provide for the erection and equipment of a national institute of dental research, comparable to the National Cancer Institute, is being considered by Congress.[11] Also, the need for experiments and for careful observation of methods of dental practice, in order that dental manpower and facilities may be used most effectively, is unquestionable. Since research of these types requires financing through a period of years, and few private organizations are able to make long-time commitments, governmental support is needed.

Provisions for the training of additional personnel cannot be safely geared wholly to current estimates of total dental needs. It has to be assumed that research may result in newer knowledge on how to prevent some dental disease and defects, and may reduce the estimated amount of care that will be needed in future years. A moderate expansion of personnel—measured against present unmet need—must be contemplated; but even this

10. Planning for the Returning Dental Officers. *J.A.D.A.* 32:619 (May 1) 1945.

11. *Dental Research and Dental Care.* Hearings Before a Subcommittee of the Senate Committee on Education and Labor on S. 190 and S. 1099, 79th Cong., 1st sess., June 26-28, 1945. Report on S. 190, Senate Committee on Education and Labor (Report 1363) 79th Cong., 2d sess.

implies a considerable expansion of present educational and training facilities.

The prospect for an additional supply of dental personnel from the present dental schools is not encouraging. In the school year 1938-39, the total enrollment in the thirty-nine dental schools of the United States was 7,331. In the peak period of 1928-29, the total enrollment was 8,200 students.[12] Within the past twenty years, extensive changes in educational requirements have doubled the time necessary after completion of high school to secure a dental degree. This has resulted in a large reduction in enrollments. As a result of this and other factors, including the effects of the depression of the 1930's, the number of annual dental graduates decreased 23 per cent between 1910 and 1940. In contrast, the population of the country increased 42 per cent. Approximately 25 per cent of the dentists practicing in 1940 were graduated prior to 1910.[13]

It appears at this time that the existing dental schools need to be expanded; that additional schools are needed; and that both the schools and the prospective students need aid in financing dental education. And it needs to be kept in mind that there will be a lapse of some years, after an educational expansion is undertaken, before the graduates will be available. Experience during the war with an accelerated program and nearly full utilization of existing facilities resulted in a temporary increase in the number of dental graduates.

The number of dentists necessary for adequate dental care will be considerably influenced by the extent to which auxiliary personnel is used in the future. The number of dental hygienists practicing today is not known; estimates range from 3,000 to 7,000. Surveys indicate that approximately one-half of all hygienists are now employed by schools, hospitals, and other institutions. A recent survey of 1,442 dentists showed that less than 4 per cent employed hygienists.

Dental services can also be augmented by more effective use of the 35,000 assistants and 18,000 technicians estimated to be available.[14] While some persons, both dentists and others, have advocated that the scope of services of both hygienists and technicians be broadened, so as to permit them to perform certain services now restricted by statute to dentists, the extent to which this may be wisely and safely done is not settled. However, various studies indicate that dental services can be increased more than 50 per cent if hygienists and assistants are used for prophylaxis services and if dentists work with two chairs instead of one. In the case of children's programs particularly, where services can be rendered advantageously through organized clinics, the services of dental hygienists and dental assistants—for prophylaxis and other services which they may be fully competent to perform under the direction of dentists—would contribute much to the efficiency of the program. Some dental leaders urge the use of such auxiliary personnel even for nonclinic services. To what extent the dental profession and the American people will accept enlarged scope of service from dental hygienists, dental assistants, and other auxiliary personnel is not established. The subject deserves careful study and actual experimentation.

12. Ibid., Asgis, Alfred J., p. 100.
13. Ibid., Robinson, J. Ben, pp. 135-136.
14. Morrey, op. cit., p. 131.

Dental Health Education of the Public

There is broad agreement that no dental health program will be successful without effective health education of both children and adults. Although the present accumulated neglect is due largely to difficulties in paying for dental care, failure of the public to appreciate the importance of proper dental care has also played an important role. The American Dental Association has urged dental health education as among the essentials for extending dental care to the population. This is based on their opinion that the need for reparative services can be substantially reduced through dissemination of dental hygiene information among the public, primarily through urging early treatment of developing dental disease. A dental health program for children and adults requires cooperation with other health and related agencies, especially the departments of health and education.

Design of an Initial Dental Program

Since a comprehensive program of dental care is impractical within the next few years, many dentists and the American Dental Association have urged that the limited resources of the nation be first utilized for children. They argue that if adequate dental

care is provided to the children of this generation, and the service program is extended by one year of age each year, the next generation of adults will be free from accumulated neglect. Some who advise the adoption of this plan would largely ignore current adult needs —so far as an insurance or a similar public-health program is concerned; others would combine comprehensive care for children with the maximum that is practical for adults.

Dental Care for Children

The development of dental diseases and defects is progressive with age. A study of the dental needs of elementary-school children in a small city, where the general population is representative of the broad middle range of socio-economic groups in the United States, indicates that—per 1,000 children—at the age of 6, 382.3 permanent tooth surfaces show evidence of caries attack; the dental-attack-rate increases progressively with age until at 15, an average 1,000 children have 14,276.6 surfaces showing evidence of caries.[15]

Surveys have shown that white persons between the ages of 6 and 20 need, among other services, an average of more than one filling annually.[16] Applying this rate to the 35,000,000 persons of all races in this age group, the services of about 12,000 dentists (one-sixth of all dentists) would be required for fillings alone. Dental prophylaxis to persons in this age group, on the basis of one-half to one hour of service a year per person, would require an additional 9,000-18,000 dentists (one-eighth to one-fourth of the present dental personnel). These figures are based on an annual maximum of 2,000 hours of service per dentist. Accumulated needs for fillings from prior years would require for this group more than 150,000,000 dentist hours, which—on the basis of 2,000 hours of service annually per dentist—would mean the services of 75,000 dentists, or more than the present total number of dentists in the nation.

In 1940, the 35,000,000 persons in the age group from 6 to 20 represented almost 30 per cent of the "dental population" of the country (those between the ages of 2 and 65). If the services of about one-third of the present dental personnel were used to provide care to this age group, a maximum of about 50,000,000 hours of service would be available yearly. According to a canvass made during 1928-31, white children aged 5-14 who were members of family groups with annual incomes from $5,000-$10,000 received, on the average, dental services equivalent to one and one-half to two hours of care annually. Those in the younger group 5-9 received less service than the children from 10 to 14. (When services were considered on the basis of the $5,000-and-over family-income group, the volume of service for children 5-14 was higher, owing principally to the increased volume of orthodontic services received by the higher-income group.) The 50,000,000 hours of service available from one-third of the dentists would provide an average of about one and one-half hours of service to the 35,000,000 persons in the 6-20 age group, or the average amount of service received by younger children in families having annual family incomes of $5,000-$10,000 in 1928-31.[17] According to standards of complete care, however, services received by children even in the higher-income group are not adequate. Therefore, this volume of service would not be sufficient to prevent entirely further accumulated need or to eradicate completely the results of past neglect to be found among children of all income groups, particularly among those who are members of lower-income families.

This estimate of care for those in the age group 6 to 20 must be qualified by two reservations. On the one hand, it is by no means safe to assume that one-third of the dentists would be willing to furnish only services for children; or, to put the matter otherwise, that dentists as a whole would be willing to give one-third of their man-hours to care of children. On the other hand, it is not altogether safe to assume that actual demand for care for those in the age group 6 to 20 would rapidly increase from its present lower level to that observed in families in the $5,000-$10,000 income level.

If complete care could not be given to the entire 6-20 age group, an alternative initial program would be to offer complete care to children in the lower school grades, and emergency treatment to all others in the age

15. Klein, Henry, and Palmer, Carroll E., The Dental Problem of Elementary School Children. *Milbank Memorial Fund Quarterly* 16:267-285 (July) 1938.

16. Klein, op. cit., p. 263.

17. Collins, Selwyn, Frequency of Dental Services Among 9,000 Families Based on Nation-Wide Canvasses, 1928-31. *Public Health Reports*, April 21, 1939, pp. 629-657, and unpublished data.

group, at least through the high-school level. The upper age of those eligible for complete care could then possibly be increased a year each year.

Complete dental care for children has been defined as follows: (1) emergency care to include alleviation of pain, extraction of nonrestorable teeth and treatment of acute dental infections; (2) periodic examinations by a dentist to include x-ray and other necessary diagnostic procedures, and prophylaxis; (3) care on a planned continuing basis to keep the mouth in the best possible condition; (4) treatment of malocclusion when necessary for efficient mastication.[18] An initial program for children using the time-equivalent of approximately 25,000 dentists for a year, and designed to give complete care to children in the lower grades (including the eradication of accumulated needs) and emergency care to the older group including those of high-school age, would probably be able to provide complete care for children in the first four to six elementary school grades.

Initial Dental Care for Adults

Various approaches have been explored with regard to the possible content of a dental care program for adults which, at the outset, would be limited in scope. The proposal to limit the services to low-income groups or to specified adult age groups must be dismissed as being incompatible with fundamental characteristics of an insurance system. Limitation of services to those prescribed by physicians (as well as dentists) has value only for a program restricted to the most urgent and most serious conditions, and invites complex problems of relationship between physicans and dentists. Limitation in terms of the dollar value of services that may be available to each individual has some practical possibilities; but it also has serious shortcomings—if the dollar limit is high it may invite more service than can be furnished and if it is low it will fail to give protection to those who need it most.

It is suggested here that an initial dental-care program for adults should undertake: (1) to assure the availability of minimum-essential services; and (2) to expand the scope of service as rapidly as may be practical in light of operating experience, on the basis of administrative decisions reached in consultation with a competent advisory body that includes both professional and nonprofessional persons.

Minimum Services

As a result of various conferences and consultations with dental advisers, it would appear that a minimum content of dental services, to apply to all who are eligible for benefits under the insurance system, might properly and reasonably include *at least* the following services: (1) examinations (including x-ray survey) and diagnosis; (2) prophylaxis; (3) extractions of teeth considered likely to be injurious to general health; and (4) treatment of acute diseases of the teeth, their supporting structures and adjacent parts, including fracture of the teeth or jaw. A complicated question arises whether extractions covered by this minimum specification—under either item (3) or item (4)—should require the opinion of an attending physician in addition to the opinion of the attending dentist. The point needs further study.[19]

These minimum dental services are suggested for inclusion from the beginning, if practicable, whether or not additional or broader services are also included. Extractions, in general, are not intended to be included in this list of minimum services, because it probably would be unwise to provide for such extractions in any period when reparative services are not also provided—lest provision of only extraction services should invite or encourage the removal of teeth that can and should be repaired. Dental consultants have advised, however, that it would be unwise to exclude all extractions. Thus, if item (3) in the list of minimum services had to be restricted to those extractions advised by both a physician and a dentist, it would

18. Eliot, Martha M., *Dental Research and Dental Care.* Hearings Before a Subcommittee of the Senate Committee on Education and Labor on S. 190 and S. 1099, 79th Cong., 1st sess., June 26-28, 1945, p. 180.

19. For example, it has been suggested by a dental adviser that extraction of acutely diseased teeth, such as those with acute abscesses, advanced periodontal disease causing pain, cavities that involve an aching pulp, should be understood as being included in this minimum. He argues that the judgment of the dentist as well as the acuteness of the condition require placing the decision to extract in the hands of the dentist, without requiring the time-consuming procedure of physician-consultation. Another dental adviser thinks that items (1), (2), and (3) should not be included; in his opinion only item (4) should be retained in a definition of the minimum services, with accompanying provisions making it possible for the insurance system to bear a part of the costs of these dental services and to provide more extensive services for the lower age groups.

mean that however low the level to which dental services had to be restricted at the outset, they should in any case still include extractions which both the physician and the dentist recommend. Extension of extraction services should be instituted when reparative services are also included in the insurance benefits.

The content of an initial dental health program for adults, and the rapidity with which such a program can be extended, will depend principally upon the size of the dental personnel participating in the program. For example, using the calculation made earlier, if one-third or more of the dental personnel of the country were being used in providing complete dental care to younger children and limited care to older children, the remaining dentists available in an early year of operation would be between 45,000 and 50,000, with a capacity of less than 100,000,000 man-hours of service.

No reliable estimate is available on the man-hours or number of dentists (and auxiliary personnel) that would be required to furnish the suggested minimum services that might, at the least, be provided as insurance benefits. However, preliminary calculations indicate that this minimum program may be within the capacity of the remaining available resources—along with more comprehensive services for children, especially if auxiliary personnel and multiple chairs are used. How much of a margin there would be for adult services above the level of the minimum remains uncertain. A conservative approach is therefore indicated.

The uncertainties as to scope, content and cost of dental benefits, and the importance of administrative decisions both in limiting the dental program initially and in expanding it later, indicate that the responsible administrative officers of the insurance system would have to come before the Congress for annual or periodic review and approval of their plans and proposals.

Cost Estimates for Dental Care

More than a decade ago, it was estimated that adequate dental care would cost about $10.70 per capita on a continuing annual basis.[20] This was at a time (1929-31) when the people of the United States were spending, on the average, about $3.90 per capita for dental care and less than 22 per cent of the total population were receiving any dental care in the course of a year. The United States did not have then, and does not have now, the personnel needed to provide adequate dental care for the entire population. Consequently, any calculation of the total national cost of adequate dental care is meaningful only for a theoretical condition many years in the future. For a population of about 140,000,000 people, $10.70 per capita suggests a total sum of about $1.5 billion a year, at 1929 or 1941 levels of payments for dentists and auxiliary services.[21] As against such a figure, it may be noted that total payments for dental services were about $500 million, or one-third as much, in each of those years.[22]

Since it is futile to consider, for the near-time future, a program of complete and adequate dental services under the insurance system, there is no point in bringing the cost of such a program into the estimated costs for the insurance system—except possibly for some future year, ten or twenty years after inauguration of the system, and by that time dental needs and the costs of providing the services might be quite different.

A more practical step is to ask, first, what would the costs be if all the available personnel and resources were utilized wholly under the insurance system. Total payments to all private practitioners (representing nearly the total expenditures for all dental services) are shown in Table 9.[23]

Gross payments are the total paid to all private or independent dental practitioners; net payments are the amounts remaining to the practitioners after deducting the costs of practice (costs of supplies, laboratory work done outside, salaries of assistants, office expenses, etc.). These figures suggest that the

20. Falk, I. S., Rorem, C. R., and Ring, M. D., *The Costs of Medical Care*, 1932, p. 241.

21. It was estimated in 1932 that adequate annual dental care would have required about 219,000 dentists if they themselves did all their subsidiary work (there were about 57,000 dentists in private practice and about 62,400 altogether at that time); and about 121,000 dentists and about 110,000 subsidiary personnel (x-ray technicians, hygienists, and laboratory technicians) if dentists did only chair work requiring professional services and used assistants for strictly routine and mechanical tasks.

22. Figures, except for 1929, from Denison, E. F., Incomes in Selected Professions. *Survey of Current Business* 24:17 (April) 1944; 1929 figures from Falk, Rorem, and Ring, op. cit.

23. Denison, op. cit., p. 17.

full use of existing resources would involve about $500 million a year (at the 1941 price and income levels). This means, roughly, about $300 million in net payments to dentists and about $200 million for auxiliary personnel, laboratory services, office expenses, etc. With about 65,000 dentists (full-time active practice in 1941) the figures equal, on the average, approximately $7,700 in gross and $4,600 in net income, in terms of 1941 dollars. If any of these figures were to be applied to a postwar year, they would have to be adjusted for postwar cost levels. As in the case of physicians' incomes, the adjustment factor for the present year and for the near-time future is an increase of about 50 per cent above the 1941 level. Thus, for the purpose of estimating costs for the insurance system, it may be assumed that dentists should receive, on the average, about $6,900 a year in net income. By comparison with 1941, this net income figure for dentists serving insured persons is equivalent to an average gross annual income of $11,550 per dentist. These figures include general practitioners and specialists (partial and complete) in the proportions which obtained in 1941.

As a second step, we may consider what the costs might be, depending upon the extent to which the dental manpower of the nation participates in the insurance system. For example, a national program utilizing the services of approximately 25,000 dentists to give services to children would cost about $270 to $300 million annually, at present and prospective income levels. If the services of another 25,000 dentists could be utilized in an initially limited dental program for adults, this would involve as much again. Thus, a program providing care to adults and children and using the services of approximately 50,000 dentists, and the auxiliary personnel, would cost about $540 to $600 million a year.

Table 9.—Total payments to private dental practitioners, 1929-41

[In millions of dollars]

Year	Gross	Net
1929	446	266
1933	276	148
1937	350	195
1941	468	252

In light of these various estimates, it would appear that a minimal program undertaken by the insurance system at the outset might provide services that would reach about $250 million a year in the first, second, or third full year of operation, at 1941 price and income levels ($375 million a year at adjusted postwar levels); and that as the scope of dental services is expanded, it might involve $500-$750 million a year after five, ten, or fifteen years at 1941 levels ($750-$1,125 million a year at postwar levels). These figures are only loosely geared to specific kinds and amounts of services, and are at best only rough estimates of total disbursements.

Status of Dentists

It has been assumed that the status of dentists under a social insurance program should be the same as that of physicians. The dental profession should participate in administration, should have representation on advisory councils, and should be responsible for the professional supervision of professional and auxiliary dental personnel and services. Individual dentists and dental groups should have the same choice of methods of remuneration provided physicians. The rates of payment should be such that full-time practice in furnishing services to insured persons earns, for dentists as a whole, an average fair and adequate income. Payments to dentists, as in the case of physicians, should be on the basis of type of service rendered (general practitioner, part-time or full-time specialist). Policies with respect to quality of care applicable to physicians should apply equally to dentists, with such adjustments as are dictated by the special characteristics of dental services. Patients should be permitted for general practitioner services, free choice of dentists, participating in the program; dentists should be permitted to accept or refuse patients, and to choose the extent of their participation (full- or part-time) in the program. Access of the insured person to specialist services should be guided by the same policies outlined for medical services.

Payments to Dentists

As in the case of physicians, payments to dentists and auxiliary dental personnel should be geared to customary incomes and to levels

Table 10.—Average incomes of dentists in private practice (1929), by specialization

Practitioners	Average gross income	Average net income
All	$7,800	$4,700
General practitioners	7,400	4,400
Partial specialists	9,900	5,700
Complete specialists	14,300	8,400

Table 11.—Average net incomes of dentists in private practice, 1929-41

Year:	*Average dental net income*	Year:	*Average dental net income*
1929	*$4,700	1937	$2,900
1933	2,250	1941	3,800

*The figures in this table are from Denison, op. cit., except the figure for 1929, which is from Falk, Rorem, and Ring, op. cit. The corresponding figure from Denison for 1929 is $4,275.

of adequacy. Incomes in 1929[24] for private dental practitioners are shown in Table 10.

For the years between 1929 and 1941, average payments to dentists varied as for physicians, except that in 1941 average income was still substantially below the 1929 level. The changes are summarized in Table 11.

Dentists' incomes have also varied by size of community, age and years in practice, etc., as in the case of physicians. Similarly, variations in income, gross and net, among individual dentists have been like those observed among physicians.[25]

Under an insurance program, the incomes of dentists—like those of physicians—would depend upon the rates of payment, whether the dentist is a general practitioner or a qualified specialist, and the size of the practice he can achieve for himself. With payments on a fee-for-service basis, the individual dentist's income will depend on the number and kinds of service he renders; on a capitation basis, it will depend on the number of people who choose him; on a salary basis, it will depend on his skill and attainments.

The general ratio of dentists to population for a comprehensive program cannot be estimated reliably at this time; the provision of comprehensive services for the whole population cannot be achieved for a considerable number of years; and by the time such care is possible better methods of preventing dental disease and defects and of utilizing dental time, which may have evolved in the meantime, would affect considerably the potential number of patients which each dentist could serve.

On the basis of the figures for 1941,[26] and using a 50 per cent increase to adjust them to the present time and to the near-time future, it is assumed that the rates of insurance payments to dentists as a whole might reasonably be geared to the following national average *net* income figures for full-time service or its equivalent, at the indicated price and income levels—

	At 1941 levels	At 1946 levels
General dental practitioners	$4,000	$6,000
Qualified dental specialists	7,000	10,500

These, it is emphasized, are *average* figures; the net earnings of individuals could be considerably higher or lower.

Gross-income figures of prior years are not so readily utilized for present purposes, because they include some expenditures for materials that are more expensive than is dictated by considerations of essential dental need. The insurance system should properly pay only for materials (used in crowns, bridges, dentures, etc.) of the minimum cost compatible with good quality; the extra cost of more expensive materials preferred by the patient should properly be a private charge on the patient. With respect to this particular item, average gross payments from the insurance system should average somewhat less than average gross receipts of dentists. If this factor is disregarded, the suggested net incomes are equivalent—by comparison to the figures for past years—to average gross incomes of $10,000 a year for general practitioners and to $17,500 a year for qualified dental specialists.

As in the case of physicians, average rates of payments to dentists may need adjustment not only by type of practice but also by place of practice and by other relevant factors.—*Allen O. Gruebbel, D.D.S., Executive Secretary.*

24. Falk, Rorem, and Ring, op. cit., p. 237; Leven, M., *The Practice of Dentistry and the Incomes of Dentists in Twenty States*, 1929, 1932.

25. See Leven and Denison, op. cit.

26. See Denison, op. cit.

COUNCIL ON DENTAL THERAPEUTICS

COUNCIL ON DENTAL THERAPEUTICS LISTS PRODUCTS FOR "ACCEPTED DENTAL REMEDIES"

THE Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following products in the list of Accepted Dental Remedies:

Antiseptics and Antibiotics[1]

Penicillin Chewing Troches, Squibb: Round, flat, flavored, yellow troches, each containing 20,000 units of penicillin calcium.

Indications: Penicillin Chewing Troches may be used as an adjunct to the basic manipulative treatment of Vincent's infection and other diseased conditions of the mouth in which the infecting organisms are susceptible to penicillin, provided the action of chewing is not detrimental. Chewing slowly releases the penicillin content from the troche and is said to produce a high and continuous concentration of penicillin in the saliva.

Local Effects, Systemic Toxicity and Actions: See "Penicillin," A.D.R., Ed. 12, p. 103.

Dosage: The recommended dosage is 3 or 4 troches a day, each troche being taken after a meal and kept in the mouth until the next meal, or until bedtime, being chewed every minute or so. When high continuous concentrations of penicillin are desired, a troche may be chewed each hour or two.

Penicillin Chewing Troches, Squibb, in boxes of 6: Manufactured by E. R. Squibb & Sons, New York.

Anesthetics—Local[2]

Procaine HCl 2%, Epinephrine 1:25,000-"Oryl" Brand:

Procaine HCl 2%, Epinephrine 1:50,000-"Oryl" Brand:

Procaine HCl 2%, Neo-Synephrine HCl 1:3500-"Oryl" Brand: Composition: See Exodontia Products Co., Chicago. Distributed by Dental Products Company, Chicago.

Admission of a product to the list of Accepted Dental Remedies means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics which is available upon request, and inquiries are welcomed.—*Donald A. Wallace, Secretary.*

1. A.D.R., Ed. 12, p. 103.

2. A.D.R., Ed. 12, p. 48.

U. S. FOOD AND DRUG ADMINISTRATION

SEIZES MISBRANDED ASTRING-O-SOL

THE following Notice of Judgment, No. 1594, was issued by the Food and Drug Administration of the Federal Security Agency in August 1946:

Misbranding of Astring-O-Sol. U.S. v. 90 Dozen Bottles and 114 Dozen Bottles of Astring-O-Sol. Default decree of destruction. (F.D.C. No. 6182. Sample No. 73243-E.)

Libel Filed: On or about October 31, 1941, by the Nyal Co., from Detroit, Mich.

Product: Astring-O-Sol, 90 dozen 8-ounce bottles and 114 dozen 4-ounce bottles at Kansas City, Mo. Analysis showed that the product consisted essentially of 68 per cent alcohol, 4.6 per cent methyl salicylate, 0.38 per cent zinc chloride, and water. Bacteriological examinations showed that in a concentration of 1 part of the product to 8 parts of water it was neither an antiseptic nor a germicide.

Label, in Part: (Carton and bottle) "Astring-O-Sol * * * Concentrated Antiseptic Germicide An Astringent Mouth Wash Throat Gargle Economical To Use Refreshes Morning Mouth For Germicidal and Other Uses"; (carton) "a pleasant, refreshing Mouth Wash, Throat Gargle, Dentifrice, Gum Massage * * * This 4 oz. bottle makes 6 full pints of refreshing mouth wash and throat gargle"; (bottle) "Antiseptic Germicide Concentrated Directions As a Refreshing Mouth Wash, Gargle and for Offensive Breath Add Several Dashes of Astring-O-Sol to One-Quarter Glass of water, but use enough to give a pleasant tingling sensation to the mouth."

Nature of Charge: Misbranding, Section 502 (a), the labeling of the article was false and misleading because it created the impression that the article, when used in the dilutions mentioned in the labeling as a mouth wash and throat gargle, would be antiseptic and germicidal, whereas in such dilutions and in dilutions of 1 part of the preparation to 8 parts water, a concentration greater than that recommended for mouth wash and throat gargle use, the article was neither antiseptic nor germicidal.

Further misbranding, Section 502 (i), the container of the article was so made, formed, and filled as to be misleading since the bottle occupied less than 50 per cent of the volume of the carton.

Disposition: December 24, 1942. Frederick Stearns and Co., claimant, having withdrawn its answer to the libel with the permission of the court, judgment was entered ordering that the product be destroyed.

ACCEPTANCE OF CO-RE-GA DENTURE

ADHESIVE POWDER IS ANNOUNCED

AT ITS annual meeting on April 5 and 6, 1946, the Council on Dental Therapeutics voted to accept certain brands of denture adhesive powder, subject to its rules and to the following special provisions:

1. All advertising, labeling and educational material must have been passed upon favorably by the Council office before they are used. The Seal of Acceptance or any statement to the effect that the product has been accepted by the Council on Dental Therapeutics must not appear on the package until

all distribution by the firm of advertising, educational material or labeling which has not been passed upon favorably by the Council office has been discontinued.

2. Samples shall not be distributed knowingly to persons other than dentists. This provision shall not apply to distribution of samples in customary and reasonable quantities to persons in attendance at commercial exhibits held in connection with meetings of the American Dental Association or its component or constituent societies.

3. Samples shall not be supplied knowingly either directly or indirectly to any mail-order denture house or dental laboratory.

4. The following statement shall appear on every trade package: "Ill-fitting dental appliances may impair health—consult your dentist regularly." The Council will give consideration to alternative statements designed to accomplish the same effect.

5. Acceptance will not be announced until the Seal of Acceptance appears on all trade packages.

The Corega Chemical Company, Inc., has met the foregoing provisions to the best of its ability, considering the shortages of packaging materials which exist today. Announcement of acceptance of Co-Re-Ga Denture Adhesive Powder is therefore made.

Co-Re-Ga Denture Adhesive Powder: Each 100 gm. is stated to contain karaya gum, 98.186 gm.; magnesium carbonate, U.S.P., 0.274 gm.; methyl salicylate, oil of peppermint, menthol, 0.068 gm.; and gum resin, 1.472 gm. Manufactured by Corega Chemical Company, Inc., Cleveland, Ohio.

Admission of a product to the list of Accepted Dental Remedies means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics which is available upon request, and inquiries are welcomed.—*Donald A. Wallace, Secretary.*

BUREAU OF PUBLIC RELATIONS

"THE STORY OF AN ASSOCIATION"

AVAILABLE IN REVISED EDITION

A NEWLY-REVISED edition of the booklet, "The Story of an Association," which describes the development of the American Dental Association, is now being distributed by the Bureau of Public Relations. Copies may be obtained without charge by any member in good standing.

The new edition was edited by Lon W. Morrey, director of the Bureau of Public Relations. In an informal, easy-to-read style, it describes the growth and expansion of organized dentistry from its inception 106 years ago at Baltimore, Md. Its sixty-four pages are packed with information of current value to every member of the profession.

Subjects treated range from a short history of organized dentistry to a complete summary of current activities of the organization, its committees, councils and bureaus.

Included is an outline of the Association's governmental structure with de-

scriptions of the powers, responsibilities and duties of the House of Delegates, the Board of Trustees and elective and appointive officers. The section on government is illustrated with an organization chart of the Association. Another feature is an organization chart of the Central Office, showing staff authority with titles of administrative heads and the number of employees in each department.

There is a special chapter on finances which shows the major sources of income and principal expenditures of the Association. Other of the twenty-six sections of the handbook explain in detail the principal activities and functions of each department and bureau and of a majority of standing and special committees. In all, the booklet provides a thorough view of activities of interest to dentists all over the country.

The new edition is the first revision that has been made of the booklet since it was originally published in 1941. The drab gray of the front cover of the original booklet has been replaced with a bright blue and the revised text has been made more readable by the use of modern typography and improved layouts.

Copies may be secured free of charge by sending a postal card to the Bureau office at 222 East Superior St., Chicago 11.

NEW PUBLICITY RECORD SET AT MIAMI MEETING OF HOUSE OF DELEGATES

COMPLETE press and radio coverage of the eighty-seventh annual meeting of the House of Delegates of the American Dental Association at Miami in mid-October was provided by the press relations department of the Bureau of Public Relations.

In addition, the Bureau also provided information service to the press and radio for the various associated groups which held annual meetings at Miami and Miami Beach immediately prior to and simultaneously with the House of Delegates sessions.

Florida newspapers gave the meeting a large amount of space and numerous stories were sent to all parts of the country by the three major news wire services: Associated Press, International News Service and United Press.

All five radio stations in Miami and Miami Beach cooperated fully. Each carried a special program on dentistry in addition to reporting the various news stories which resulted from the meetings.

Preliminary reports from clipping services reveal that stories regarding the convention were published in all major sections of the nation.

In Miami and Miami Beach, the four daily newspapers printed eighty-seven different news and feature stories accompanied by thirty-six photographs concerning the Association and its related groups. Total space devoted by Miami area daily newspapers to dentistry and the House of Delegates meeting was 12,283 agate lines, a new record for a streamlined meeting limited entirely to business matters.

Prior to the convention, individual stories listing the names of delegates and alternates from each state were sent to their home state newspapers. This re-

quired the preparation of fifty-one different news releases and the mailing of these releases to 350 newspapers.

During the meeting, the press relations department prepared and distributed reports on convention activities to Miami newspapers and radio stations and the three principal press associations. Special photographs were made available to photograph syndicate services.

Special stories on the selection of Boston for the 1947 full scientific meeting were telegraphed to all Boston newspapers. News releases and photographs were sent to the home state papers of all newly-elected officers and trustees immediately after their elections.

In all, the press relations department issued eighty news releases and sent out more than fifty photographs concerning the House of Delegates meeting and annual sessions of associated groups.

The radio activities arranged in conjunction with the meeting included a number of spot announcements prior to the opening sessions.

First of the series of special radio programs broadcast by Florida stations was a half-hour round table discussion of dental health problems, on Thursday evening, October 10, over radio station WKAT of Miami Beach, affiliated with the Mutual network. Participating in the broadcast were Walter H. Scherer, of Houston, Texas, then President of the Association; Sterling V. Mead, of Washington, then President-Elect; Hugo Kulstad, of Pomona, Calif., chairman of the Council on Dental Health; Harlan H. Horner, of Chicago, secretary of the Council on Dental Education, and Lon W. Morrey, also of Chicago, director of the Bureau of Public Relations.

On Saturday evening, October 12, just before the opening of the House of Delegates meeting, station WGBS, affiliated with the American Broadcasting System, broadcast the first of thirteen transcriptions in the series, "Tales from Ivory Towers." The entire series, featuring dramatized stories interspersed with dental health messages, was carried by the station.

On the day the convention opened, Lloyd Dodd, of Decatur, Ill., president-elect of the Illinois State Dental Society, represented the Association in a fifteen-minute broadcast prepared by the Bureau on "The History of Dentistry." He spoke over station WIOD, which is affiliated with the National Broadcasting Company.

On October 16, the one hundredth anniversary of the first successful demonstration of the anesthetic properties of sulfuric ether by William T. G. Morton at Boston, Stephen P. Mallett, of Boston, a member of the Massachusetts delegation, told the story of ether in a special program over station WQAM, an affiliate of the Columbia Broadcasting Company.

During the week the House of Delegates was in session, a series of six transcribed programs, "Dental Health for America," was broadcast by station WIODFM. These programs, each five minutes in length, were produced by the Bureau in cooperation with the Health Advisory Committee of the United States Chamber of Commerce.

Friday evening, prior to the opening of the House meeting, officers and members of the Board of Trustees met members of the Miami press and radio staffs at an informal reception at the Columbus Hotel.

E. B. Penn, general chairman of local arrangements, E. C. Lunsford, vice-chairman, and the various subcommittee chairmen and members provided the Bureau with invaluable assistance.

The local publicity committee, headed by Horace L. Cartee, did an outstanding job in preparatory work and in assisting the Bureau staff in handling publicity for the meeting. In addition to Dr. Cartee, members of the publicity committee were A. E. Rosenthal, Alfred Walker and W. W. Mitchell.

EDUCATIONAL FILMS AND PAMPHLETS READY FOR DISTRIBUTION

A SET of eleven technical films, seven additional dental health educational pamphlets and two professional publications are among new and revised material now available to members of the American Dental Association through the Bureau of Public Relations.

The new movies, several in color, were produced by the United States Navy Dental Corps and have been loaned to the Association for use by state and component societies. They range in running time from a seven-minute film on "The Process of Human Dental Caries," to a forty-five-minute movie on "Dentistry, Anterior Acrylic Bridgework." Other films deal with oral hygiene, jaw fractures, construction of crowns, bridges and inlays, amalgam restoration, fixed bridges, oral prophylaxis and duties of dental technicians. A complete list may be obtained from the Bureau office. The service charge for each film is $2 plus express charges.

The new and revised dental health pamphlets, just off the press, are in envelope size and attractively illustrated. They include a new booklet on oral hygiene, "Help Yourself to a Healthy Mouth," and revised editions of "How Early Should Dental Care Begin," "Dental Care for the Preschool Child," "School Programs for Dental Health," "Oral Diseases," "Vincent's Infection of the Mouth" and "Diseases of the Gums and Other Supporting Tissues of the Teeth and Their Treatment." All of these pamphlets are available at five cents a copy and at reduced rates for orders of fifty or more.

Popular with children is the Bureau's new illustrated booklet on the customs, habits and dental health of the Chippewa Indians entitled "Pete Meshakee." This booklet, prepared especially for children 8 to 12 years of age, includes a short Ojibway-English dictionary. It is recommended particularly for distribution to child patients and for intermediate grade teachers for use as supplementary reading for their pupils. The booklet is available at ten cents a copy with reduced rates for fifty or more.

Most popular among new Bureau publications at present is the new 1947 A.D.A. Appointment Book. To date, more than 12,000 copies of the original printing of 15,000 have been sold. The new book includes a variety of exclusive features. A full week's appointments may be listed on a double page. It provides for a patient recall system and contains a catalog of books on dentistry available at the A.D.A. library, a separate catalog of dental health educational literature and a list of local anesthetics and dentifrices acceptable to the Council on Dental Therapeutics. The book sells for $1.50 a copy.

Also among A.D.A. "best sellers" is the revised edition of "Atlas of the Mouth," written by Maury Massler and Isaac Schour. This leather-bound work contains 180 illustrations interpreting normal and abnormal conditions of the mouth. The price is $2.50 a copy.

Sterling V. Mead
President

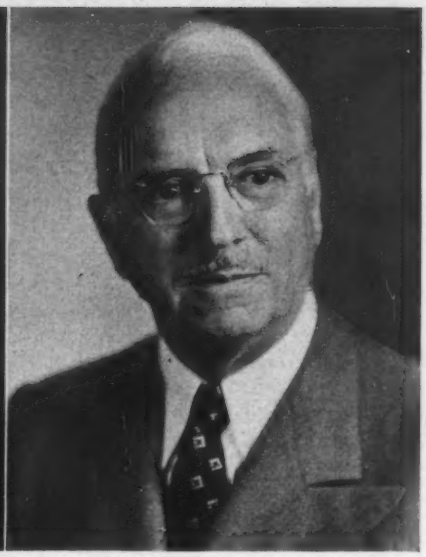

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Photo by Howard A. Hartman

Percy R. Howe Honored

Percy R. Howe, left, director of the Forsyth Dental Infirmary for Children, Boston, accepts the 1945 American Dental Association plaque honoring him for distinguished service to dentistry in research. The plaque was presented at the Miami meeting by President Walter H. Scherer, right

Photo by Howard A. Hartman

W. T. G. Morton Plaque

Stephen P. Mallett, Boston, on the right, is shown presenting the W. T. G. Morton Centennial plaque to President Walter H. Scherer of the American Dental Association at the Miami meeting, on behalf of the Morton Centenary Committee. An identical plaque was presented to the Massachusetts General Hospital, Boston

Photo by Howard A. Hartman

Delegates and Guests at the A.D.A. Miami Meeting

Five attendants at the American Dental Association's eighty-seventh annual meeting in Miami are, from left to right, M. Don Clawson, president, Meharry Medical College; Sterling V. Mead, President, American Dental Association; Percy R. Howe, director of the Forsyth Dental Infirmary for Children; Sam Lewin-Epstein, past president of the Palestine Dental Association; and Enrique C. Aguilar, secretary, Mexican Dental Association

NATIONAL CENTENNIAL CELEBRATIONS

OCTOBER 16 MARKED FIRST PUBLIC USE

OF ANESTHESIA BY W. T. G. MORTON

THE focal point of nation-wide celebrations during the week of October 16 commemorating the first successful public demonstration by William T. G. Morton of the use of ether as an anesthesia was the anniversary meeting in Boston—the city where Morton gave the demonstration.

The Boston meeting was arranged by the William T. G. Morton Centenary Committee of the American Dental Association, which set up state, local and national celebrations to mark the anniversary of a vital step in the history of dentistry and medicine. Kurt H. Thoma, Boston, was chairman of the special committee.

Members of the committee were: Frank W. Rounds, Stephen P. Mallett, Harry Archer, C. Raymond Wells, Leon A. Storz, Don J. Aubertine, Howard R. Raper, author of *Man Against Pain*, James H. Maycock and Frederick E. Grant.

The Massachusetts General Hospital, where Morton first administered ether in public on October 16, 1846, sponsored a three-day program October 14-16 to mark the centennial.

The agenda included a symposium on various aspects of the use of surgical anesthesia. Among the speakers were Raymond B. Fosdick, Rockefeller Foundation; Evarts A. Graham, Washington University; Harry K. Beecher, Harvard University; and K. T. Compton, Massachusetts Institute of Technology.

Among the other celebrations held on October 16 was a memorial program sponsored by the staff of the Department of Pharmacology at the School of Medicine, University of Maryland. Speakers at the program were Henry E. Sigerist, Johns Hopkins University; J. Ben Robinson, University of Maryland; and Henry S. Smith, editor of the *Journal of Anesthesiology*.

On October 15 several celebrations were held in the state of Massachusetts. One was at Morton's birthplace in Charlton, Mass., where a memorial plaque was erected in recognition of Morton's outstanding contribution to humanity. The plaque was presented to the town of Charlton by Dr. Thoma.

A dinner meeting was held by the Morton committee at the Hotel Statler on the evening of October 15. The program opened with a speech on the famed ether bell which is kept in the Massachusetts General Hospital and which was on view at the dinner. The speech by Dr. Thoma touched on the history of the bell, one of two made to commemorate the first two operations using ether, performed in America and London.

Dr. Raper, noted authority on the history of anesthesia, dealt with past discoveries and developments in the field, and Arthur W. Allen, chief of East Surgical Service at the Massachusetts General Hospital, spoke on "The Influence of the Discovery of Anesthesia on Surgery."

A Morton Memorial Plaque was presented to the Massachusetts State Dental

Society by Dr. Thoma as chairman of the Morton Centenary Committee. The plaque was accepted on behalf of the society by Herbert I. Margolis, vice-president of the society, in the absence of Harold H. Hookway, president.

A. D. A. AFFAIRS

ANNUAL CHRISTMAS SEAL DRIVE FOR RELIEF FUND IS STARTED

The sale of Christmas Seals for the Relief Fund of the American Dental Association is again under way this year with the mailing of the Seals to all members. Although the sale of the Seals has increased during the twenty-two years since the Relief Fund was started, the need for contributions is greater than ever this year with the high percentage of dentists released by the armed forces.

Total receipts from the Seal Campaign last year were $46,407.21 as compared with $49,724.75 in 1944 and $36,716.22 in 1943.

Starting in January 1948, the Relief Fund will be built up through the earmarking of $1 of the annual membership dues for relief purposes. The House of Delegates, at the Miami meeting, adopted an amendment to the Constitution raising the dues $1 (to $7 a year) the increase to be used for relief. Half of this dollar will go to the American Dental Association Relief Fund and half to the state relief fund in states where an approved fund is set up. Until the increase in dues becomes effective, it is especially important that all members contribute to the Relief Fund by buying Seals.

Returns may be made at once in the envelope accompanying the Seals. Address to the Relief Fund, American Dental Association, 222 East Superior St., Chicago 11.

DENTAL SOCIETIES

PROGRAM COMPLETED FOR NEW YORK DENTAL MEETING

A forum discussion on the question of "The Advisability of Extraction as a Therapeutic Aid in Orthodontics" will be one of the many attractions at the twenty-second annual Greater New York Dental Meeting, to be held in the Hotel Pennsylvania, New York, December 9-13.

The affirmative side in the forum will be taken by Robert H. W. Strang, Bridgeport, Conn., and Arthur W. Greenstein, New York. John W. Ross, Philadelphia, and Leuman M. Waugh, New York, will appear on the negative side of the question.

The meeting, sponsored by the First and Second District Dental Societies of the State of New York, will offer a varied program of educational and technical films in dentistry and related fields, interspersed with general speaking sessions, more than one hundred clinics and a series of dental exhibits.

Among the speakers on the agenda will be Milburn M. Fowler, Assistant Medical Director for Dental Services, Veterans Administration; Sterling V. Mead, President of the American Dental Association; Daniel Jutton, president-elect of the Dental Society of the State of New York; Maj. Gen. Lewis B. Hershey, National Director of Selective Service; and Isidore Teich, president of the First District Dental Society of the State of New York.

Willard S. Bell is general chairman of the meeting. Information about the program and reservations for the meeting may be secured through K. Neil Donally, chairman, Press and Publication Committee, Room 106A, Hotel Pennsylvania, New York 1.

Commemorate First Successful Use of Ether

Participants in the W. T. G. Morton Centennial celebration in Boston are, from left to right, in the top picture, Howard R. Raper, Herbert I. Margolis, Harold G. Wolff, Basil G. Bibby, Howard M. Marjerison, Sidney C. Wiggin and A. L. Sagoff. In the middle picture Kurt H. Thoma, right, is shown presenting the Morton Plaque to the Massachusetts State Dental Society. From left to right are Arthur W. Allen, Dr. Raper, Dr. Margolis, who accepted the plaque, and Dr. Thoma. Four Tufts men who took part in the celebration are shown in the bottom picture. They are, from left to right, Dr. Bibby, Dr. Marjerison, Dr. Wiggin and Dr. Sagoff

Morton Centenary Celebration in Boston

Head table guests at the W. T. G. Morton Centennial Dinner celebration in Boston are, from left to right, in the top picture, John Hickey, Harold E. Tingley, Arthur W. Allen, Kurt H. Thoma, chairman of the A.D.A. Morton Centenary Committee, and Howard R. Raper. In the middle picture the famed ether bell of the Massachusetts General Hospital is displayed by Dr. Thoma, on the right, and Dr. Allen. In the lower picture are speakers on the A.D.A. program. They are, from left to right, Dr. Hickey, Sidney C. Wiggin and Harold G. Wolff

RHODE ISLAND DENTISTS TO MEET JANUARY 20-22

The Rhode Island State Dental Society will hold its annual meeting January 20-22, it was disclosed last month. Place of the meeting has not yet been announced.

A preliminary program lists the following speakers: William I. Ogus, Washington, "Electrosurgery," "Surgical Preparation of the Mouth for Immediate Dentures," and "Surgical Correction of Extreme Prognathism"; Louis Alexander Cohen, New York, "Full Mouth Rehabilitation"; Charles F. Bodecker, New York, professor emeritus, Columbia University, "Clinical Importance of Oral Histology"; and Henry M. Goldman, Boston, "Periodontal Treatment with Special Emphasis on Pocket Therapy."

In addition, Dr. Ogus will join Harold A. Kent, Frank W. Rounds and Max H. Jacobs, all of Boston, in a symposium on "The Lower Third Molar."

CANADIAN DENTAL JOURNAL AVAILABLE TO ALL DENTISTS

The *Journal of the Canadian Dental Association* is now available to all dentists. Dentists in good standing with other national associations may become associate members of the Canadian Dental Association at a fee of $4, which includes a subscription to the journal.

Dentists desiring a subscription to the journal are requested to write to D. W. Gullett, business manager, 211 Huron St., Toronto, Ontario.

CLEVELAND DENTAL SOCIETY ORGANIZES VETERANS CLUB

The World War II veterans in the Cleveland Dental Society have organized a Veterans Club to work with the society on all matters pertaining to ex-servicemen.

The club is planned to seek help from the dental society and to offer advice on matters of common interest to the veterans and the society.

J. Richard Loughry will serve as chairman of the club, and John C. Jaynes will be secretary until the organization is completed.

DISTRICT OF COLUMBIA TO OPEN LICENSE EXAMINATIONS JANUARY 6

Henry A. Swanson, secretary-treasurer of the Board of Dental Examiners of the District of Columbia, has announced that the board will hold its next examination for licensure in the District of Columbia January 6-10, 1947.

SCIENCE ASSOCIATION TO HOLD SYMPOSIUM ON PERIODONTIA

The central subsection of the American Association for the Advancement of Science will meet December 29 at the Statler Hotel in Boston for a symposium on "Biological Aspects of Periodontal Disease," Isaac Schour, secretary of the subsection on dentistry, has announced. Interested members of the profession are welcome to attend.

MAYNARD K. HINE TO ADDRESS DENTAL HYGIENISTS ASSOCIATION

Maynard K. Hine, dean of the School of Dentistry, Indiana University, will address the Dental Hygienists Association of New York City, December 12, at the Hotel Pennsylvania, New York, on the topic "Periodontia."

ALABAMA DENTAL SOCIETY PLANS APRIL ANNUAL MEETING

The Alabama Dental Association will hold its seventy-eighth annual meeting in Birmingham April 8-10, 1947, George W. Matthews, secretary-treasurer, has announced.

New University of Washington Medical Center

Architect's plans for the new medical, dental, nursing and pharmacy school building at the University of Washington in Seattle. Ground will be broken for construction about February 1, and completion of the structure is planned fifteen months later. The first unit to be built will be the School of Dentistry, situated in the center of the building with a clinic overlooking the lake

DENTAL SCHOOLS

UNIVERSITY OF WASHINGTON TO BUILD MEDICAL, DENTAL UNITS

Architect's plans have been completed for a new medical, dental, nursing and pharmacy school building at the University of Washington in Seattle.

Ground will be broken for the School of Dentistry, first unit scheduled for construction, about February 1. The building will be completed approximately fifteen months after work is started.

The first freshman dental class ever to be enrolled at the University started October 2 with fifty students housed on the top floor of the chemistry building.

The new dental unit has been planned under the supervision of Ernest M. Jones, dean of the School of Dentistry, who is interested in designing furnishings and equipment for the new school.

Dr. Jones has designed a chair and dental unit equivalent to a small private dental office for the use of junior and senior students in the clinic.

CHANGES ANNOUNCED IN STAFF PERSONNEL AT ZOLLER CLINIC

Five changes in the staff personnel at the Walter G. Zoller Memorial Dental Clinic, University of Chicago, have been announced.

Surinder N. Bhaskar, formerly with the Dental School, Northwestern University, has been appointed assistant in dental surgery. Dr. Bhaskar is in this country on an R. D. Sethna Trust Scholarship, doing graduate work in dental research.

Harold A. Hunter, on leave of absence from the faculty of dentistry, University of Toronto, will continue clinical and laboratory studies in oral pathology. Lois High has been granted a fellowship in biochemistry at the clinic.

Two staff members are leaving the clinic. Robert M. Stephan will conduct research work as a dental surgeon with the U. S. Public Health Service at the National Institute of Health, Bethesda.

Md. Elizabeth S. Hemens, bacteriology instructor at the clinic, has been appointed assistant in the Department of Medical Bacteriology at the University of Illinois.

THREE APPOINTMENTS TO TUFTS DENTAL FACULTY ARE ANNOUNCED

Basil G. Bibby, dean of the Tufts College Dental School in Boston, has announced three new appointments to the dental school faculty.

Charles E. Hatch has been named associate professor of clinical dentistry; Finn Brudevold was appointed assistant professor of prosthetic dentistry; and Malvin F. White was named professor of oral and facial surgery.

Dr. White, who was chief of plastic surgery in the ninety-first evacuation hospital during the war, will also teach in the Tufts College Medical School.

Dean Bibby announced that all but four of the eighty-nine students in the present freshman dental school class are veterans.

PUBLIC HEALTH

C. W. WALDRON NAMED ADVISER TO FEDERAL HOSPITAL COUNCIL

Carl W. Waldron, professor of oral surgery at the School of Dentistry, University of Minnesota, has been appointed dental member of the advisory committee to the newly-formed Federal Hospital Council.

The Council was recently set up by the Administrator of the Federal Security Agency to assist the Surgeon General in administering the Hospital Survey and Construction Act.

Members of the Federal Hospital Council are: Albert W. Dent, president of Dillard University, New Orleans; the Very Rev. Msgr. John J. Bingham, director of the Division of Health, Catholic Charities, New York; Graham L. Davis, director of the Division of Hospitals, W. K. Kellogg Foundation, Battle Creek, Mich.; Robin C. Buerki, dean of the Graduate School of Medicine, University of Pennsylvania; Michael Davis, Committee for the Nation's Health, New York; J. Melville Broughton, attorney, Raleigh, N. C.; Mrs. Evelyn Hicks, radio station WTNB, Birmingham, Ala.; and Clinton N. Golden, United Steel Workers of America, Pittsburgh, Pa.

CHILD DENTAL PROGRAM IS STARTED IN INDIANA TOWN

A fact-finding survey on dental health among school children in Richmond, Ind., is being organized this fall by a steering committee appointed by the Richmond Dental Association. The survey was first proposed for Indiana by John W. Knutson, Senior Dental Surgeon of the U. S. Public Health Service in Washington.

The five- or six-year survey is planned to determine the increment of dental caries through study of a representative child population by caring first for the accumulated dental defects and then for annual needs.

Dental clinics will be used to study the cost of complete dental care and the amount of service which can be rendered by each dentist, and to measure the demand for readily available dental care service.

All public and parochial school children in grades one to nine are eligible for complete dental care, with the exception of orthodontic treatment, regardless of their family financial status.

The study aims to promote private dental practice by encouraging children who are or who have been private patients to continue treatment with a private dentist, and to encourage the development of regular habits among the children in the program so that they

will continue to seek dental care after passing on from the ninth grade.

Follow-up workers have been assigned to promote and interpret the study to teachers, parents and children. Children who have been receiving care from a family dentist will be referred to him by the follow-up worker.

A detailed dental examination record will be obtained annually for each child who is eligible for the program. Authorization for all service will be given by the parents of the children.

Personnel conducting the program consists of one supervising operating dentist, four U. S. Public Health Service dentists, one dental hygienist, five dental assistants, one follow-up worker and two clerks.

The demonstration study has been accepted by the Indiana State Dental Association, the Eastern Indiana Dental Association, the Indiana State Board of Health and the Richmond Dental Association. The survey was offered to Richmond by the Council on Dental Health of the Indiana State Dental Association.

FIRST STEP COMPLETED IN RHODE ISLAND DENTAL SURVEY

The first step in a six-year study of school dental care in Woonsocket, R. I., has been completed with the examination of the teeth of 1,500 children in grades one to nine.

Officials conducting the survey said that preliminary results indicated that approximately 85 per cent of the children had never received dental treatment, with the exception of extractions. The program, undertaken last year, is sponsored by the city and conducted and directed by the U. S. Public Health Service with the endorsement of the Rhode Island State Dental Society.

The program is designed to provide data on the cost, time and personnel required to give school children complete dental care. The Woonsocket study is being conducted in twenty-seven public and parochial schools and one orphanage.

Parental permission is obtained before the child is treated at the dental clinics set up under the program. The project is based both on the correction of current dental defects and on the maintenance of annual care.

RESEARCH GRANTS DIVISION SET UP AT INSTITUTE OF HEALTH

Thomas Parran, Surgeon General of the U. S. Public Health Service, has announced the establishment of a Research Grants Division at the National Institute of Health, Bethesda, Md.

The division will administer the Research Grants-in-Aid Program of the Public Health Service under Public Law 410, which authorizes the Surgeon General to make grants-in-aid for research projects recommended by the National Advisory Health Council, the National Advisory Cancer Council and the National Advisory Mental Health Council.

Advisory committees of scientists and research workers have been appointed by the Public Health Service to insure efficient administration of the grants-in-aid funds. Recommendations of these committees provide the basis on which final decisions regarding grants are made by the National Advisory Health Council.

The Dental Studies Section, representing dentistry, is composed of nine dentists or dental research workers. Five are chosen at large, and the remaining four represent the Army, the Navy, the Veterans Administration and the Public Health Service.

Members of the Dental Studies Section are: Paul C. Kitchin, Ohio State University, chairman; H. Trendley Dean, National Institute of Health, executive secretary; Hermann Becks, University of California; Harold C. Hodge, University of Rochester; George C. Paffenbarger, National Bureau of Standards; Isaac

Schour, University of Illinois; Lt. Col. Joseph L. Bernier, U. S. Army; Cmdr. Carl A. Schlack, U. S. Navy; and Vern D. Irwin, Veterans Administration.

In addition, one dentist has been appointed to membership in the Public Health Methods Studies Section. He is John T. O'Rourke, Tufts College.

U.S. PUBLIC HEALTH SERVICE ANNOUNCES NEW ASSIGNMENTS

The U. S. Public Health Service has announced two personnel assignments. Norman Garrie, dental surgeon, has been transferred to Kansas City, Mo., to the Health Service District Seven headquarters, as dental consultant to the district.

District Seven comprises Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota.

Philip E. Blackerby, Jr., director of the Division of Dentistry, W. K. Kellogg Foundation, Battle Creek, Mich., has been called to active duty under the terms of his reserve commission with the Public Health Service. Dr. Blackerby has been assigned to temporary duty with the Dental Section, States Relations Division, Washington.

CHILDREN'S BUREAU MEETING STRESSES PLANNED SPENDING

The program at the meeting of the Advisory Committee of the Children's Bureau in Washington, September 16-17, stressed the need for planning to spend increased funds now available to the Bureau.

The three speakers, Watson Miller, Federal Security Administrator; Katharine F. Lenroot, chief of the Children's Bureau; and Martha M. Eliot, associate chief of the Children's Bureau, all emphasized the need for judicious expenditure of the $150,000,000 additional appropriation granted by Congress.

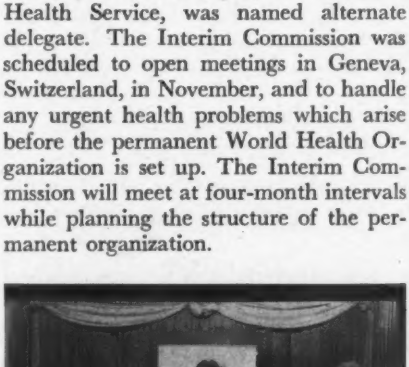
The speakers also pointed out that $22,000,000 instead of $11,200,000 is available to the states through the Bureau by amendment to the Social Security Act.

Dental representatives on the Advisory Committee were Leon Kramer and Lon W. Morrey. George R. Moore, professor of orthodontics, University of Michigan, also attended the meeting.

DR. PARRAN IS U.S. DELEGATE TO INTERIM WORLD HEALTH MEET

The appointment of Thomas Parran, Surgeon General of the U. S. Public Health Service, as United States delegate to the Interim Commission of the World Health Organization was announced September 1 by President Truman.

Harry Van Zile Hyde, of the Public Health Service, was named alternate delegate. The Interim Commission was scheduled to open meetings in Geneva, Switzerland, in November, and to handle any urgent health problems which arise before the permanent World Health Organization is set up. The Interim Commission will meet at four-month intervals while planning the structure of the permanent organization.



Morton Window Exhibit

Window display in memory of William T. G. Morton's first public administration of ether on October 16, 1846. The exhibit has been on display recently in the window of a national drugstore chain in Chicago

CASES AND COMMENTS

"Temporary Protection of Prepared Bridge Abutments"

To the Editor: A statement made in the abstract of my paper (Temporary Protection of Prepared Bridge Abutments, J. 2nd Dist. D. Soc. (N. Y.) 32:157, April 1946) in the September 1946 issue of THE JOURNAL is incomplete and therefore misleading.

The fifth sentence in the abstract begins: "Properly prepared forms may be used repeatedly and over periods of several months. . . ." This sentence should read: "Properly prepared aluminum shell crowns for posterior teeth may be used repeatedly and over periods of several months. . . ."—*Abraham I. Sheppard, D.D.S., 1 Hanson Place, Brooklyn 17, N. Y.*

Fédération Dentaire Internationale

To the Editor: In the June 1 issue of THE JOURNAL we saw a report on "A Mission to Western Europe To Renew Professional Relations with Dentists of War-Ridden Countries" by Dr. Edward J. Ortion, in which certain statements were made concerning the future activities of the *Fédération Dentaire Internationale (F.D.I.)*.

To prevent misunderstandings, we want to state that no member of the Bureau of the *Fédération Dentaire Internationale* decided to call a meeting of the *Fédération* in London where we would have a professional program and election of officers under the chairmanship of the present secretary general, nor did we endeavor to arrange for the first postwar meeting of the *Fédération* to coincide with the meeting of the American Dental Society of Europe.

I may add that the first official meeting of the Bureau took place in Brussels on June 24, 1946, where several members of the Executive Council were also present. At that meeting, among other things, the vacancies of the Bureau were filled. Dr. Harvey J. Burkhart, of Rochester, N. Y., was elected honorary president as a token of deep appreciation for all he has done in the course of years for international dentistry and of our high personal regard for this representative from the United States. Mr. A. E. Rowlett, Leicester, England, was elected as successor to our very much beloved deceased president, Dr. W. H. G. Logan, of Chicago. The Bureau is now composed as follows: Honorary President, Harvey J. Burkhart, Rochester, N. Y.; Honorary Vice-President, W. Guy, Edinburgh; President, A. E. Rowlett, Leicester, England; Vice-Presidents, A. L. J. C. van Hasselt, The Hague; M. Roy, Paris; Secretary General, Ch. F. L. Nord, Amsterdam; Assistant Secretary, A. Joachim, Brussels; Treasurer, P. Fontanel, Paris; Assistant Treasurer, A. J. Held, Geneva.

These new nominations will have to be approved by the members of the Executive Council who were not present.

We intend calling the first official meeting of the Executive Council in November 1946 in Paris, at the occasion of the Congress of the *Journées Dentaires de Paris.—Ch. F. L. Nord, Secretary General, Fédération Dentaire Internationale, 9, Johannes Vermeerplein, Amsterdam, Holland.*

"Mission to Europe"

To the Editor: I have read, with absorbing interest, in your June issue, the report by Edward J. Ortion on his mission to Europe. I must congratulate Dr. Ortion, not only on the magnanimity of his outlook, but also for the valuable suggestions which he offered as likely to lead to a stabilization of scientific and fraternal links after six years of devastating warfare.

It is unfortunate—doubtless the time factor was responsible—that Dr. Ortion did not interview that *doyen* of the dental profession, William Guy, LL.D. (Pennsylvania), F.R.S.E., F.R.C.S., L.R.C.P. & S., L.D.S., upon whom the Royal College of Surgeons of Edinburgh recently conferred an honorary H.D.D.

In spite of his 87 years, Dr. Guy is, to my personal knowledge, still active, and his brain is as alert as ever. Although deafness undoubtedly handicaps him, there are few, if any, dentists alive today who can equal him in knowledge and breadth of vision in international dental affairs.—*J. Menzies Campbell, F.R.S.E., D.D.S., L.D.S., 14 Buckingham Terrace, Glasgow, W. 2, Scotland.*

Device for Irrigation in Pericoronitis. By Melvin L. Morris, D.D.S., New York.

Penicillin and the sulfonamides have proved their worth in the treatment of oral infections. However, the basic surgical principles of débridement, irrigation and free drainage of suppurating lesions must still be followed.

Pericoronitis of the lower third molar is no exception. The necrotic food débris, pus and calcareous deposits should, as much as possible, be carefully removed and the pericoronal space irrigated with a warm solution. A 20-gage Luer-Lok needle is easily modified for this purpose (Fig. 1). In Figure 2 the needle has been inserted sideways between the occlusal surface and the flap, and then rotated to direct the lavage to the most distant recesses. Depending on the formation of the pocket, access may also be gained by way of buccal and lingual surfaces.—*1100 Grand Concourse.*

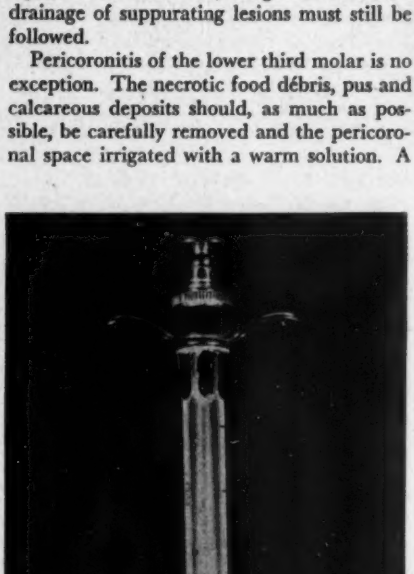


Fig. 1.—Modified 20-gage Luer-Lok needle used for irrigation in pericoronitis

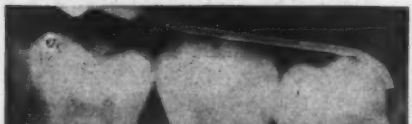


Fig. 2.—Insertion of needle for irrigation in pericoronitis of lower third molar

"The Reaction of Dental Pulps to Silicate Cements"

To the Editor: The last sentence in my article, "The Reaction of Dental Pulps to Silicate Cements," which was published in the October 1 issue of THE JOURNAL, reads: "A nonirritating base such as zinc oxide-eugenol cement should be used, especially in young patients." A zinc oxide-eugenol base *immediately followed* by a silicate cement would seriously interfere with the esthetic and physical properties of the final silicate restoration. If, on the other hand, the zinc oxide-eugenol base were to be placed several days in advance of the final silicate cement, I do not think it would interfere with the final silicate restoration.—*H. A. Zander, D.D.S., 416 Huntington Ave., Boston 15.*

BOOK REVIEWS

A Memoir to the Academy of Sciences at Paris on a New Use of Sulphuric Ether. By W. T. G. Morton of Boston in the U.S.A. Presented by M. Arago in the Autumn of 1847. A reprint with a foreword by John F. Fulton. 24 pages. Paper. Price $1.50. New York: Henry Schuman, 1946.

This memoir was prepared by W. T. G. Morton for presentation to the Academy of Sciences at Paris after he had discovered that Charles T. Jackson, his preceptor, had secretly directed memoranda to the Academy claiming full credit for the discovery of surgical anesthesia. It is a reasoned and well-written memoir presenting, of course, the best possible aspects of Morton's claims. It throws much light on Morton's personal position and is absorbingly interesting.

The memoir has been reprinted separately as appropriate to the occasion of the ether centennial. It is the fourteenth publication in the series issued by the Yale Medical Library and maintains the high standards of preparation and appearance that are characteristic of previous volumes.

Victory Over Pain: A History of Anesthesia. By Victor Robinson, M.D. 338 pages. Illustrated. Cloth. Index. Price $3.50. New York: Henry Schuman, 1946.

The Morton Centennial Celebration of 1946 is properly commemorated by the appearance of a new history of anesthesia. This one includes even such recent developments as refrigeration anesthesia and the use of curare as an anesthetic agent. It is in no sense a resurvey of the century-old controversy regarding the discovery of anesthesia, as the author is at some pains to be noncommittal about his own deductions on priority from the material he has studied. He characterizes Raper's recent book, *Man Against Pain*, which certainly expresses definite opinions on the subject, as "the work of a dentist who uses his pen like a dental drill to impress his opinions on the readers." A little of this same quality in Robinson's writing would have sharpened the many portraits of men who took a part in this epochal discovery and demonstration.

The first third of the history is occupied with the early efforts to conquer pain. It is briskly written and forms a good background for the next section which the author terms "The Discovery." This chapter includes a fine series of portraits of the men who played a part in giving anesthesia to the world: Long, Wells, Jackson and Morton. They are carefully drawn from the historical viewpoint, and the general reader will not be displeased with the broad strokes that sometimes fail to produce real definition of character and motive. After these portraits, a scant four pages are devoted to the controversy. The author's conclusion on this important matter seems to be that "a mere two years after the discovery became generally known, the American public was wearied to the death of the controversy, which continues to this day." If the historian's job is merely to relate facts, and not interpret them in the light of passing generations, this section does not fail but constitutes rather interesting reading.

The remainder of the book is taken up with the reception of the discovery of anesthesia in Europe, with chloroform and with the beginnings of local anesthesia. There is a final chapter on technics and the newer anesthetic agents which is excellent in both content and scope. The epilogue seems to have been added to give a proper "literary" touch to the "musings by the nameless monument" to ether which stands in the Public Garden in Boston.

Robinson, who is also the author of the popular *The Story of Medicine* (1931), writes crisply and with a fine feeling for the dramatic situation. His story has pace and style. It will serve as a reference for the student of this phase of medical history and, as well, as an absorbing piece of what reviewers call "nonfiction" for the average reader.

This book is the product of a new publisher who will apparently specialize in the field of medical history. It is hoped that his list will be extensive enough to include dental topics which cry for the pen of a historian. *Victory Over Pain* is beautifully produced after designs by Stefan Salter. Its typography and press work, with the exception of an occasional illustration, are recommended to those who believe that current shortages jus-

tify the production of shoddy and careless books.

The Centennial of Surgical Anesthesia: An Annotated Catalogue of Books and Pamphlets Bearing on the Early History of Surgical Anesthesia. Exhibited at the Yale Medical Library, October 1946. Compiled by John Fulton, M.D., and Madeline E. Stanton, A.B. 102 pages. 8 illustrations and frontispiece. Index. Paper. Price $4.00. New York: Henry Schuman, 1946.

This is an excellent and comprehensive bibliography of the literature dealing with the early history of surgical anesthesia. It is the fifteenth in a series of scholarly works on medical history issued by the Yale Medical Library. There is a foreword by the compilers in which they "subscribe wholeheartedly" to the conclusions on the ether controversy enunciated by the late Sir William Osler, who holds succinctly, if not incontrovertibly, that "Morton convinced the world: the credit is his."

In the annotations and short introductory sections, which greatly enhance the value of this bibliography, there is a large amount of information which sets the various books and pamphlets in their historical background. In the section on "Horace Wells and Nitrous Oxide," the views of Archer, Soifer, Steiner and others are recognized. Indeed, the compilers make this partial concession to Wells's claims for priority, which they admit are "most impressive": "Wells made a serious attempt to convince the world that he had made a discovery; and had the world listened, his claim over Morton would certainly be valid."

The list of materials described is extensive but not yet complete. Many of the fugitive pamphlets on ether of 1846-1847 are represented in the collection. Rare items, many beyond the province of the private collector, are found in satisfactory number. The collations and descriptions of the various items are sound, and the census of other copies will interest the student of bibliography and the collector.

Another word must be said here for the excellence of the publications issued by this firm. They are typographically superior and may well become collector's items of the future. All students of the ether controversy and of the fascinating literature surrounding it should immediately add this valuable volume to their private collections.

Science — The Endless Frontier. By Vannevar Bush, director of the Office of Scientific Research and Development. 184 pages. Paper. Price 35 cents. Washington: U. S. Government Printing Office, 1945.

This book provides interesting and instructive reading on the need for promoting research and scientific development. Its content is made up largely of opinions and recommendations of recognized authorities in the fields of science and education.

The author, in a report to the President of the United States, summarizes the findings of four committees on methods for maintaining military security, for supporting the war against disease, for aiding research activities by public and private organizations and for discovering and developing scientific talent in American youth.

In addition to the recommendations of the four committees, the book contains factual information on the present status of, and trends in, scientific research in American universities and colleges.—*Allen O. Gruebbel.*

Better Health for Rural America. By the United States Department of Agriculture, Interbureau Committee on Post-War Programs. 32 pages. Washington, October 1945.

According to the findings of the committee, which was made up of nine representatives of federal agencies, farm people are agreed that they want more physicians, nurses and dentists in their communities, more hospitals and better sanitary facilities, more preventive medicine and public health clinics, easier ways of paying their doctor bills and all the benefits of first-class medical science that they read about.

The booklet apparently expresses the committee's views on the causes and effects of rural health problems as well as suggestions for solving them. A very good case is built up for group planning to improve health and welfare facilities in rural areas, and logical conclusions are drawn as to how local health services can be expanded; but the attempt to convince the reader that a national compulsory health insurance system is the only final answer is not expressed in the same convincing style as is the presentation of other and perhaps less controversial proposals.—*Allen O. Gruebbel.*

CURRENT LITERATURE

Odontoma of the Nasopharynx. G. McClure. Arch. Otolaryng. 44:51, June 1946.

It is stated that, so far as could be learned by a careful search of the literature, an odontoma of the nasopharynx has never before been adequately described. The anatomy of the nasopharynx and the diagnosis and treatment of tumors found therein are discussed at length.

An asymptomatic growth was discovered in the pharynx of a 6-year-old girl. After observation for six years, the growth was described as a large, hard, fixed mass on the left lateral wall in the region of the orifice of the eustachian tube. Roentgenograms revealed the presence of a molar tooth in the area. Hearing was said to be reduced in the left ear, and speech was thickened. An embryonic bony tumor with a deciduous tooth, double rooted, embedded posterior and internal to the left mandibular ramus, was removed. Eight years later a comparable growth removed from the same area was classified as a compound odontoma. The recurrence was ascribed to growth of a small portion of the primary tumor known to have been left in place.—*D. F. M.*

Time per Service in a Children's Dental Clinic. I. Altmann. Pub. Health. Rep. 61:1211, August 16, 1946.

A study of the time required to perform certain routine dental operations for children was made in the clinics of the Philadelphia Mouth Hygiene Association. Over 2,700 observations for 1,068 children were tabulated. The average number of minutes per operation was found to be as follows: prophylaxis, 15.5; tooth filling, 16.8; extraction of a deciduous tooth, 9.3; extraction of a permanent tooth, 12.5; polishing of filling, 11.8.

Differences by color, sex and age are shown in accompanying tables. In general, these differences are small: Operating time for prophylaxes, fillings and extractions among twelve dentists showed wide variation, but little association with age and experience of the practitioner. The average time reported in the two other studies is greater than that found in this investigation, but the validity of the comparison is questionable.—*J. E. G.*

The Inhibitory Action of Saliva on the Diphtheria Bacillus: The Antibiotic Effect of Salivary Streptococci. Richard Thompson and Madoka Shiburja. J. Bact. 51:671, June 1946.

The resistance to infection by the oral tissues was the impetus to this work, which investigated the inhibitory action of saliva upon the diphtheria bacillus. The following results were obtained: Pure cultures of the Streptococcus mitis type of viridans streptococci isolated from saliva inhibited the growth of diphtheria bacilli in the same manner as fresh saliva. The inhibitory action of saliva could not be demonstrated after the streptococci had been removed from it by filtration, centrifugation, heat or the bactericidal effect of copper. The inhibitory actions of saliva and of pure cultures of mitis streptococci were affected similarly by several factors: the triptose content of the medium, the antagonistic action of the staphylococci, heat and the use of nutrient materials as diluents.—*H. G.*

The Role of Cancellous Bone in Plastic Surgery. Stuart Gordon. Surgery 20:202, August 1946.

Cancellous chip grafts have been used to repair defects in the skull, malar bone and mandible and, to some extent, in the hand. Properly done, that is, with thin shinglelike chips laid in staggered rows, one above the other, and in good contact with living bone at the circumference, skull defects of small size can be closed adequately. Malar defects and defects about the orbit can be repaired by molding cancellous chips into proper shape to eliminate the defect. The largest field of usefulness to date has been the repair of nonunion of the mandible. Sixty-one cases were analyzed for this study.

The author is of the opinion that cancellous chip grafts have a very definite and valuable place in plastic surgery. Speed of the union is the result of the marked stimulus to bone formation from periosteum, bone and endosteum of the recipient site, and the ease with which cancellous chips can be overlaid and replaced.—*H. G.*

Microdetermination of pH in Saliva. B. Schmidt-Nielsen. Acta physiol. Scandinav. 11:97, 1946.

A method is reported for determination of pH in saliva from the parotid and mandibular glands. Bulmann's capillary quinhydrone electrode, which requires only 0.08 to 0.02 ml. of sample, is utilized. A syringe pipet (Krogh) is employed for taking samples. A mercury seal is employed to prevent escape of carbon dioxide, since it has been shown that the rate of carbon dioxide diffusion through paraffin oil is only four times slower than in water. Saliva is collected from the parotid gland through a rubber cup similar to that of the Gore saliva separator. Mandibular saliva is sucked directly into the syringe pipet from the floor of the mouth just under the tongue. Determinations are carried out to demonstrate the accuracy of the method in comparison with methods used by former investigators.—*J. E. G.*

The pH in Parotid and Mandibular Saliva. B. Schmidt-Nielsen. Acta physiol. Scandinav. 11:104, 1946.

The author's method for determination of pH in saliva was used throughout the following experiments. Resting saliva can be obtained only when the subject studied is sitting completely at rest. Even talking, mastication, coughing or similar activity causes a marked increase in the pH of saliva. The pH of resting parotid saliva is remarkably constant for a single subject, not only during twenty-four hours but also from day to day and from month to month. The pH of mandibular saliva does not show quite the same constancy, a finding which may be partly the result of the sampling technic used. The pH of parotid saliva from forty persons ranges from 5.45 to 6.06 (average 5.81). The pH of mandibular saliva ranges from 6.02 to 7.14 (average 6.39). Stimulation causes a considerable rise (up to 2 pH units) in the pH of the saliva. Gustatory, olfactory and mechanical stimuli were tried. Gustatory stimuli were found to have the most pronounced effect on the pH.—*J. E. G.*

The Smooth Tongue. M. Faber. Acta Med. Scandinav. 121:179, 1945.

Although it is known that the abnormal coating of the tongue results from reduced mechanical cleaning of the tongue, the cause of the smooth atrophic mucous membrane of the tongue is not yet understood. A review of the literature is given regarding the diseases in which an affection of the tongue may be expected. It is concluded that one must differentiate between (1) a smooth atrophic mucous membrane as seen, for example, in iron deficiency anemia, ariboflavinosis, gastric achylia and sometimes in pernicious anemia, and (2) affection of the tongue which is found in other patients with pernicious anemia, and which is in its classical form described by Müller (1851) and Hunter (1901). Still a third type of glossitis is observed in pellagra.

Examination of fifty-one patients with smooth atrophic tongue shows that the salivary secretion is always reduced except in the rare case of a local cause such as aphthous stomatitis. It is shown further that the reduction of the salivary secretion (except in aphthous stomatitis) is found in all forms of smooth tongue and that the mucous membrane of the tongue again becomes normal when the secretion rises to normal values. The author concludes from these and various other observations that atrophy of the mucous membrane must be caused by the xerostomia.—*Hyman Goldberg.*

A Method in the Management of Multiple Facial Fractures. H. Hoyle Campbell. Surgery 20:204, August 1946.

The method presented is merely a modification of other existing methods with application of the stirrups for maintenance of support of the nasal fragments, and with the use of submalar wiring. For the external fixation, coat-hanger wire and adhesive tape can be used and bent in any required position. This will serve equally as well as the more elaborate appliances shown and its success depends solely on the ingenuity of the operator.—*Hyman Goldberg.*

Erythema Exudativum Multiforme. A. Weisberg and E. Rosen. Arch. Derm. and Syph. 53:79, February 1946.

The authors consider erythema exudativum multiforme a single clinical entity which may involve skin and mucous membranes and should not be separated into symptom complexes. Several cases are presented which responded well to massive daily doses (400 mg.) of nicotinamide.—*Paul H. Keyes.*

Electrical Excitation of Teeth and Its Application to Dentistry. Hilding Björn, from the Nobel Institute for Neurophysiology, Karolinska Institute, and the Department of Operative Dentistry, State Dental Institute, Stockholm. 101 pages. Swedish D. J. 39: Supplementum, 1946.

Björn reports the construction of an electrical pulp tester which is capable of eliciting exact, specific, reproducible reactions measured in the lower microampere ranges. The stimulator employs direct current shocks of 10 msec. with a range amplitude of 0-140 microamperes. The rectangular current curve produced was found by neurophysiologists to be suitable for nerve stimulation. The mechanism employs an internal resistance so high that variations in the resistance of the outer circuit do not affect the strength of the passing current; that is, determination of current is ascertained by the applied voltage and not by changes in the outer resistance such as enamel and dentin. The electrodes used employ unipolar stimulation, the cathode being the exciting electrode and a metal cylinder in the hand acting as the indifferent electrode.

With the use of this mechanism, Björn reports extensive studies to determine normal threshold values of the various teeth, their variations in reaction levels, resistance determinations of gums, exposed dentin and enamel, chronaxie determinations, and investigations on accommodation reactions of the pulp. The reaction findings of 431 teeth are studied statistically, and show a surprisingly low margin of error (3.6 per cent).

In the last section of his report, Björn demonstrates how the pulp tester may be applied in clinical practice: in the determination of pulp vitality, diagnosis of pulp diseases and investigations on the effect of local anesthetics.

The author claims that periodontal membrane reactions cannot be elicited with the 140 microampere output of his tester, so that reactions from this source do not enter as complicating findings in electrical pulp testing. The validity of the above statement is questionable since too few cases were used. The author states that periodontal membrane reactions occur between 200-400 microamperes for normal teeth and above 230 for abnormal teeth. This, too, may be questioned on the basis of similar experiments carried on in the United States.

It is maintained that the electrical pulp tester offers little hope as a means of differential diagnosis of the various degrees of pulp involvement, since diseased pulps and those with regressive changes may respond within normal limits; and, vice versa, supposedly "normal" pulps responding in normal ranges when studied histologically often reveal inflammatory changes.

Björn's electrical stimulator appears somewhat complex from the standpoint of routine clinical practice, chiefly because it was built primarily for investigational use. There is no doubt that it can be simplified to such an extent that it would lend itself readily to office use without losing any of its exacting measurements.

Björn is to be congratulated on the painstaking technic he used in compiling his data and on the variety of problems and questions in electrical pulp testing which he has boldly faced and skillfully handled. His investigations are extremely valuable contributions to the literature of electrical pulp testing and neurophysiology.—*E. V. Zegarelli.*

Extra-Oral Nerve Block Analgesia for Dental Extractions. H. M. Wood, K. M. Rains and P. A. Bramley. Brit. M. J., No. 4456, June 1, 1946, p. 835.

Dental extractions under extra-oral nerve block analgesia were performed in 112 cases, the majority of whom were suffering from subacute bacterial endocarditis, the others from congestive heart failure or severe asthma. Gross dental sepsis precluded intra-oral injections, and the condition of the patients made general anesthesia inadvisable. The anterior zygomatic approach for the upper jaw and the inferior alveolar nerve block for the lower jaw were found preferable by both anesthetist and patient. It is emphasized that the procedure should be carried out only under aseptic conditions and with a negative aspiration test. Duration of analgesia has been up to two hours with bleeding well controlled. The following minor complications have been observed: transient sixth-nerve paralysis, slight facial paralysis of extremely short duration in four cases and transient swelling of the cheek. Healing was found to be rapid and uneventful. —*R. C. L.*

DEATHS

Akers, Polk E., Chicago; Chicago College of Dental Surgery, Dental Department of Loyola University, 1910; died September 8; aged 65.

Akey, Arthur C., Merrill, Wis.; School of Dentistry, Marquette University, 1919; died September 23; aged 48.

Allen, Donald A., Toledo, Ohio; Pennsylvania College of Dental Surgery, 1882; died September 29; aged 86.

Baasen, J. B., Grafton, N. Dak.; Dental School, Northwestern University, 1901; died August 12; aged 64.

Bandelin, Carl F., Wisconsin Rapids, Wis.; College of Dentistry, University of Illinois, 1908; died August 15; aged 70.

Bedell, Orion W., St. Louis, Mo.; School of Dentistry, Washington University, 1892; died September 1; aged 76.

Blake, Edward H., South Bend, Ind.; School of Dentistry, Indiana University, 1909; died August 18; aged 60.

Blanchard, M. A., Texarkana, Texas; died August 22.

Bona, Casimir A., Chicago; died September 14; aged 44.

Boyce, Thomas J., Hazel Crest, Ill.; Dental School, Northwestern University, 1898; died September 4; aged 77.

Breen, Michael H., Los Angeles; died September 22; aged 83.

Brown, Willard, Hill City, Kan.; College of Dentistry, University of Illinois, 1909; died July 29; aged 61.

Brun, Louie E., Los Gatos, Calif.; College of Dentistry, University of California, 1895; died August 4.

Burgan, John E., St. Paul; died September 6; aged 72.

Burkhart, Harvey J., Rochester, N. Y.; Baltimore College of Dental Surgery, 1890; died September 22; aged 83.

Carr, C. Fred, Long Branch, N. J.; Baltimore College of Dental Surgery, 1900; died October 3; aged 73.

Carr, Lewis H., Newburgh, N. Y.; College of Dental and Oral Surgery of New York, 1909; died September 1.

Carrels, Frank H., Wabasha, Minn.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1903; died August 20; aged 69.

Church, Howard W., Bristol, R. I.; Tufts College Dental School, 1901; died September 29; aged 66.

Clarke, George N., St. Joseph, La.; School of Dentistry, Vanderbilt University, 1902; died August 10; aged 66.

Collins, Jerry P., Los Angeles; School of Dentistry, University of Denver, 1913; died September 13; aged 56.

Cooper, Frank L., Indianapolis; College of Dentistry, University of Illinois, 1909; died September 3; aged 58.

Cyr, Paul N., Jeanerette, La.; Atlanta Dental College, 1900; died August 24; aged 62.

David, George L., Aledo, Ill.; College of Dental Surgery, University of Michigan, 1896; died September 1; aged 72.

Davis, Charles F., Hartford, Ala.; Southern Dental College, 1899; died September 18; aged 70.

Davis, I. H., Oxford, N. C.; Baltimore College of Dental Surgery, 1903; died August 16; aged 81.

DeArmond, Oren, Oklahoma City, Okla.; Western Dental College, 1907; died September 25; aged 63.

De la Parra, Johan, Richmond Hill, N. Y.; died September 16; aged 66.

Denson, Roy L., Santa Monica, Calif.; Texas Dental College, 1914; died September 17.

Doran, J. W., Rock Island, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1902; died September 24; aged 75.

Downs, Norman, Tampa, Fla.; died October 9; aged 67.

Duncan, Virgil D., Mt. Sterling, Ky.; School of Dentistry, University of Louisville, 1916; died September 18.

Durner, Terry L., Monroe, Wis.; School of Dentistry, Marquette University, 1919; died September 15; aged 49.

Dusseau, F. X., Traverse City, Mich.; died August 22; aged 69.

Elliott, Leonard B., Corning, N. Y.; School of Dentistry, University of Buffalo, 1911; died July 3; aged 57.

Feigel, C. C., Miami, Fla.; died September 13; aged 75.

French, Walter E., Beverly, Mass.; Tufts College Dental School, 1891; died August 31; aged 78.

Fribley, Wilbur E., Chicago; Chicago College of Dental Surgery, Dental Department of Loyola University, 1895; died September 22; aged 74.

Fritz, I. A., Cass City, Mich.; died September 6; aged 85.

Gallie, Donald M., Wilmette, Ill.; Chicago College of Dental Surgery, 1891; died October 8; aged 80.

Gibbons, Frank J., Washington; Pennsyl-

vania College of Dental Surgery, 1902; died August 26; aged 53.

Hackney, J. Raymond, Cleveland, Ohio; School of Dentistry, Temple University, 1922; died August 27.

Hall, Jay M., St. Paul; College of Dentistry, University of Minnesota, 1897; died September 27; aged 73.

Harvey, Henry T., Salina, Kan.; Western Dental College, 1899; died September 19; aged 68.

Henry, Chester D., Sulphur, Okla.; died August 28; aged 65.

Holbrook, Charles K., St. Louis, Mo.; died August 30; aged 50.

Hopkins, William J., Glenside, Pa.; Pennsylvania College of Dental Surgery, 1900; died August 20; aged 63.

Jensen, A. H., Spokane, Wash.; University of Michigan, 1913; died September 7; aged 49.

Johnston, Walter E., Dunedin, Fla.; Indianapolis Dental College, 1908; died September 15; aged 71.

Kark, Emil, Racine, Wis.; American College of Dental Surgery, 1895; died in September; aged 80.

Lane, Gae M., Berkeley, Calif.; College of Dentistry, University of California, 1896; died September 7; aged 71.

Lark, William J., St. Louis, Mo.; School of Dentistry, Washington University, 1895; died August 24; aged 73.

Lennon, Carl H., Rowland, N. C.; Atlanta Dental College, 1903; died July 31; aged 66.

Lynde, Forrest H., Cambridge, Mass.; Tufts College Dental School, 1899; died September 19; aged 80.

McCallister, H. A., Topeka, Kan.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1900; died August 16.

MacDonald, J. Frederick, Somerville, Mass.; School of Dentistry, Indiana University, 1895; died in August; aged 83.

McGee, Frank A., Birmingham, Ala.; Birmingham Dental College, 1908; died September 22; aged 63.

McKee, Herbert M., Princeton, Ill.; died September 8; aged 82.

McKenzie, Thomas H., Three Oaks, Mich.; Detroit College of Medicine, Department of Dental Surgery, 1901; died August 24; aged 82.

Marggraff, Carl C., Jersey City, N. J.; School of Dentistry, Temple University, 1892; died September 23; aged 77.

Marxmiller, Homer W., Decatur, Ill.; School of Dentistry, Indiana University, 1906; died August 30; aged 71.

Mayhew, Arthur B., Palo Alto, Calif.; College of Physicians and Surgeons in San Francisco, 1898; died September 12; aged 75.

Messenger, Harry M., El Paso, Texas; died September 9; aged 75.

Mohr, Harry C., Cambridge, Mass.; died August 6; aged 70.

Nash, Louis, Great Neck, N. Y.; New York College of Dentistry, 1901; died June 12.

Nelson, James M., Ellsworth, Wis.; School of Dentistry, Marquette University, 1904; died September 26; aged 66.

Olds, Frank L., Coral Gables, Fla.; School of Dentistry, Western Reserve University, 1899; died August 28; aged 71.

Orr, Hal N., Chicago; died October 6; aged 68.

Parker, J. C., Rockwell City, Iowa; Chicago College of Dental Surgery, Dental Department of Loyola University, 1900; died September 23; aged 68.

Perlman, Harold, St. Paul; College of Dentistry, University of Minnesota, 1946; died August 31; aged 24.

Perry, Frank, Montgomery, Ala.; Vanderbilt University, 1912; died September 7; aged 56.

Peterson, Henry E., Minneapolis; died September 8; aged 55.

Pfeiffer, Henry P., West Orange, N. J.; New York College of Dentistry, 1891; died September 24; aged 77.

Ramsey, Jefferson Q., Eldorado, Ill.; College of Dentistry, University of Tennessee, 1887; died August 16; aged 84.

Rankin, D. L., Cambridge, Ohio; College of Dentistry, Ohio Medical University, 1899; died September 16.

Rebholz, Anthony F., New York; New York College of Dentistry, 1899; died August 23.

Rivard, George A., Lewiston, Maine; Dental School, Northwestern University, 1914; died September 18; aged 59.

Roberts, Willard A., Portland, Ore.; died August 13; aged 74.

Robinson, J. B., East Springfield, Pa.; died August 26; aged 68.

Rosier, George L., Independence, Iowa; Western Dental College, 1898; died August 25; aged 75.

Schroeder, Florence E., Brooklyn, N. Y.; College of Dental and Oral Surgery of New York, 1917; died September 17.

Schroeder, Oscar R., Sparta, Wis.; died August 1; aged 73.

Sell, James B., Dallas, Mo.; died September 16; aged 42.

Selsor, William L., Kalamazoo, Mich.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1896; died August 10; aged 76.

Shearer, Edwin F., Sacramento, Calif.; died September 14; aged 44.

ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	April 8-10, 1947	Birmingham	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			R. D. McDonald	Rm. 602, Valley Bank Bldg., Tucson
Arkansas	May 19-21, 1947	Little Rock	I. M. Sternberg	Merchants Bank Bldg., Ft. Smith
California	April 28-30, 1947	San Francisco	L. E. Linehan	450 Sutter, San Francisco
S. California			R. L. Borland	Rm. 615, 1052 W. Sixth St., Los Angeles
Colorado			M. R. Markley	Republic Bldg., Denver
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			J. Krygier	309 S. State St., Dover
D. of Columbia			M. E. Colvin	1726 21st St., N. W., Washington
Florida			A. J. Fillastre	603 Marble Arcade, Lakeland
Georgia			R. H. Murphy	605 Bankers Ins. Bldg., Macon
Hawaii			J. H. Dawe	P. O. Box 39, Honolulu
Idaho			H. Miller	Moscow
Illinois	Oct. 9-10, 1947	Peoria	L. H. Jacob	Jefferson Bldg., Peoria
Indiana	May 19-21, 1947	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 6-8, 1947	Des Moines	A. N. Humiston	417 Higley Bldg., Cedar Rapids
Kansas	May 12-15, 1947	Kansas City, Mo.	F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky	March 31-April 2, 1947	Louisville	J. L. Walker	640 Barbee Way, S., Louisville
Louisiana	April 10-12, 1947	New Orleans	J. S. Bernhard	407 Med. Arts Bldg., Shreveport
Maine			A. H. Garcelon	State House, Augusta
Maryland	May 5-6, 1947	Baltimore	J. H. Shackelford	706 Baltimore Life Bldg., Baltimore
Massachusetts	May 5-8, 1947	Boston	F. E. Adams	106 Marlborough St., Boston
Michigan	April 14-16, 1947	Detroit	H. C. Gerber, Jr.	1514 Olds Tower Bldg., Lansing
Minnesota	Feb. 24-26, 1947	Minneapolis	L. M. Cruttenden	408 Lowry Med. Arts Bldg., St. Paul
Mississippi	June 1-4, 1947	Biloxi	O. L. Colee	Magnolia
Missouri	May 12-15, 1947	Kansas City	C. W. Digges	Exchange Natl. Bank Bldg., Columbia
Montana	May 1-3, 1947	Missoula	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 12-14, 1947	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada			L. G. Jacob	601 Med. Dent. Bldg., Reno
New Hampshire	June 15-17, 1947	Portsmouth	F. E. Williams	814 Elm St., Manchester
New Jersey	April 27-30, 1947	Atlantic City	J. G. Carr	223 E. Hanover St., Trenton
New Mexico	May 26-28, 1947	Santa Fe	J. S. Eilar	First Natl. Bank Bldg., Albuquerque
New York	M / 13-16, 1947	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 4-7, 1947	Pinehurst	C. W. Sanders	Benson
North Dakota			F. A. Maides	Grand Forks
Ohio			E. C. Mills	290 S. Cassady Ave., Columbus
Oklahoma	April 13-16, 1947	Oklahoma City	E. Wise	Med. Arts Bldg., Tulsa
Oregon	June 5-7, 1947	Portland	W. H. Hurley	Selling Bldg., Portland
Panama Canal Z.			I. Buchin	Post Dental Surgeon, APO 834, c/o PM. New Orleans
Pennsylvania	May 6-8, 1947	Philadelphia	E. R. Aston	421 Market St., Kingston
Philippine I.			G. A. Carreon	9 Broadway, Third St., N., Manila
Puerto Rico			J. O. Porrate	16 Caribe, Santurce

Rhode Island	Jan. 20-22, 1947	Providence	M. S. Messore	707 Union Trust Bldg., Providence
South Carolina	April 27-29, 1947	Myrtle Beach	J. R. Owings	Greenville
South Dakota	May 29-31, 1947	Custer	E. W. Elmen	Sioux Falls
Tennessee	May 12-15, 1947	Nashville	E. J. Justis	Exchange Bldg., Memphis
Texas	April 28-May 1, 1947	San Antonio	W. Ogle	313 Med. Arts Bldg., Dallas
Utah			M. G. Kuhre	Trib.-Tel. Bldg., Salt Lake City
Vermont	May 25-27, 1947	Woodstock	J. A. Larrow	Middlebury
Virginia	April 14-16, 1947	Roanoke	J. E. John	804 Med. Arts Bldg., Roanoke
Washington	May 5-7, 1947	Spokane	F. J. Dingler	1502 Med. & Dent. Bldg., Seattle
West Virginia	May 19-21, 1947		C. J. Gavelda	Clarksburg
Wisconsin	March 31-April 2, 1947	Milwaukee	K. F. Crane	1833 Bankers Bldg., Milwaukee 2
Wyoming			J. D. McNiff	Laramie

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
California	Feb. 10-14, 1947	San Francisco	K. I. Nesbitt	515 Van Ness Ave., San Francisco 2
D. of Columbia	Jan. 6-10, 1947	Washington	H. A. Swanson	1726 Eye St., N. W., Washington
Kansas	Dec. 16-19	Kansas City	G. L. Teall	Box 71, Hiawatha
Kentucky	Dec. 17-20	Louisville	W. F. Walz	1114 First Natl. Bank Bldg., Lexington
Massachusetts	Feb. 10-12, 1947	Boston	J. C. Wilson	413 N. State House, Boston 33
Michigan	Feb. 3, 1947	Ann Arbor	H. T. Wood	502 David Whitney Bldg., Detroit 26
Mississippi	June 3-5, 1947		W. R. Madden	Forest
Nebraska	Feb. 4-7, 1947	Lincoln	C. A. Bumstead	924 Stuart Bldg., Lincoln
New Jersey	Dec. 9-13		W. A. Wilson	150 E. State St., Trenton
Pennsylvania	Feb. 17-22,* 1947	Philadelphia	R. E. V. Miller	61 N. Third St., Easton
South Carolina	July 7, 1947	Columbia	E. G. Bumgardner	1517 Hampton St., Columbia 29
Tennessee	Jan. 20-24, 1947	Memphis	J. J. Vaughn	1003 Med. Arts Bldg., Nashville 3
Virginia	Jan. 14, 1947	Richmond	J. M. Hughes	715 Med. Arts Bldg., Richmond 19
Wisconsin	Feb. 10-14, 1947	Milwaukee	S. F. Donovan	Tomah

* Feb. 17-19, written (dental); Feb. 18-19, written (hygienists). Feb. 20-22, clinical (dental); Feb. 20, clinical (hygienists).

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
American Association for the Advancement of Science	Dec. 29	Boston	I. Schour Secy.	University of Illinois, 808 S. Wood St., Chicago
Denver Dental Association, 40th Annual Mid-Winter Meeting	Jan. 6-8, 1947	Denver	A. G. Clarke Chm.	611 Republic Bldg., Denver 2
Thomas P. Hinman Mid-Winter Clinic	March 23-25, 1947	Atlanta	S. A. Garrett	Med. Arts Bldg., Atlanta
Chicago Dental Society	Feb. 10-13, 1947	Chicago	L. R. Hegland Ex. Secy.	30 N. Michigan Ave., Chicago
Dental Protective Association of the United States	Dec. 17	Chicago	W. I. Williams Secy.	122 S. Michigan Ave., Chicago 3
National Society for Crippled Children, 23rd Annual Meeting	Dec. 9-11	Chicago	L. J. Linck Ex. Director	11 S. LaSalle St., Chicago 3
Alpha Omega Fraternity, 39th Annual Convention	Dec. 28-Jan. 1, 1947	Detroit	B E. Gruber Secy.	2180 Bronx Parke, Bronx 60, N. Y.
Greater New York Dental Meeting	Dec. 9-13	New York	W S. Bell Chm.	Rm. 106A, Hotel Pennsylvania, New York 1

Pan American Odontological Association, 10th Annual Dinner Meeting	Dec. 11	New York	R. H. Brodsky Ex. Secy.	14 E. 81st St., New York
Greater Philadelphia Annual Meeting, Philadelphia County Dental Society	Feb. 5-7, 1947	Philadelphia	E. H. Smith Chm.	Stock Exchange Bldg., Philadelphia
Dallas Mid-Winter Clinic	Jan. 13-15, 1947	Dallas	B. Ballard Secy.	1305 Med. Arts Bldg., Dallas

INTERNSHIPS, EXTERNSHIPS, RESIDENCIES AND FELLOWSHIPS

The Children's and Infants' Hospital (a Unit) of Boston. Address Paul K. Losch, 300 Longwood Ave., Boston.

The Children's Memorial Hospital, Chicago. Administrator, Mabel W. Binner, 707 Fullerton Ave., Chicago.

Columbia University, School of Dental and Oral Surgery. Associate Dean, Bion R. East, 630 W. 168th St., New York 32.

Eastman Dental Dispensary, Rochester, N. Y.

Fellowships for Research and Graduate Work in the Dental Sciences, University of Rochester. Dean, George H. Whipple.

The Forsyth Dental Infirmary for Children. Director, Percy R. Howe, 140 The Fenway, Boston.

International Grenfell Association. Staff Selection Committee, 156 Fifth Ave., New York.

Jewish Sanitarium and Hospital for Chronic Diseases. Director, Leonard Kohn, Dental Division, E. Forty-Ninth St. and Rutland Road, Brooklyn 3, N. Y.

Joseph Samuels Dental Clinic of the Rhode Island Hospital, Providence. Director, Ernest A. Charbonnel.

Notre Dame Bay Memorial Hospital, Twillingate, Newfoundland. Address John M. Konopka, 25 W. Independence St., Shamokin, Pa.

Richmond Freeman Memorial Clinic for Infants and Children, Dallas, Texas. Executive Director, Dora B. Foster, 3617 Maple Ave., Dallas.

University of Illinois, Graduate School. Secretary, Committee on Graduate Work in Medicine, Dentistry and Pharmacy, 1853 W. Polk St., Chicago 12.

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Full Denture Prosthesis: W. W. Hurst, 2165 Adelbert Road, Cleveland, Ohio.
Partial Denture Prosthesis: Oliver C. Applegate, 216 S. State St., Ann Arbor, Mich.
Oral Surgery, Exodontia and Anesthesia: George W. Christiansen, National Naval Medical Center, Bethesda, Md.
Orthodontics: L. B. Higley, 705 S. Summit St., Iowa City, Iowa.
Periodontia: Hunter S. Allen, Comer Bldg., Birmingham, Ala.
Dentistry for Children and Oral Hygiene: Kenneth A. Easlick, University of Michigan, Ann Arbor, Mich.
Histology, Physiology, Pathology, Bacteriology and Chemistry (Research): Hermann Becks, University of California, San Francisco, Calif.
Practice Management: Gaylord J. James, 9400 Euclid Ave., Cleveland, Ohio.
Radiology: H. C. Fixott, Medical-Dental Bldg., Portland, Ore.
Hospital Dental Service: W. Harry Archer, 804 Professional Bldg., Pittsburgh, Pa.

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Council on Dental Therapeutics: Harold S. Smith, 6 N. Michigan Blvd., Chicago, Ill.
American Red Cross: George A. Coleman, 15th and Locust Sts., Philadelphia, Pa.
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Woman's Auxiliary: Stella Risser, Medical Arts Bldg., Houston, Texas
Gorgas Memorial: Russell W. Bunting, 916 Church St., Ann Arbor, Mich.
Dental and Medical Relations: C. Raymond Wells, 1 DeKalb Ave., Brooklyn 1, N. Y.
Prosthetic Dental Service: H. O. Lineberger, 804 Professional Bldg., Raleigh, N. C.
Military Affairs: Olin Kirkland, Shepherd Bldg., Montgomery, Ala.
War Memorial: L. H. Renfrow, Selective Service, 21st and C Sts., N. W., Washington, D. C.

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
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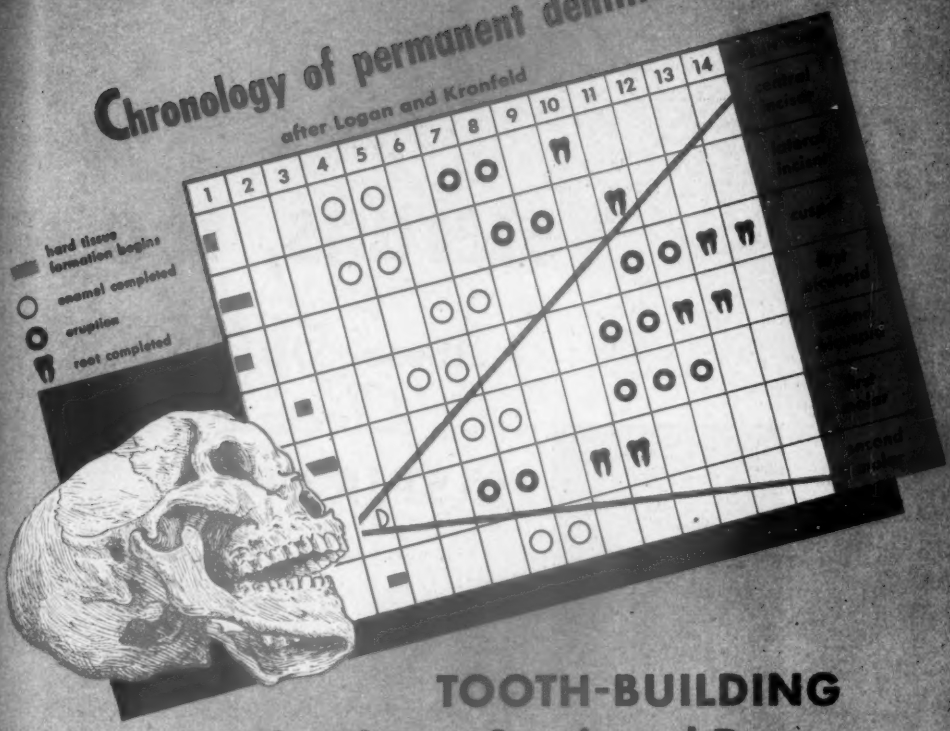
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after Logan and Kronfeld
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enamel completed
eruption
root completed

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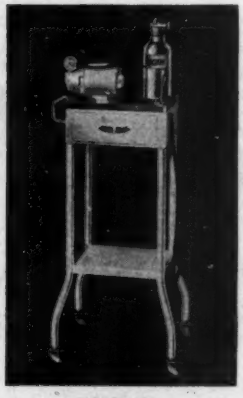

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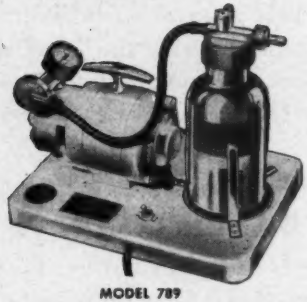

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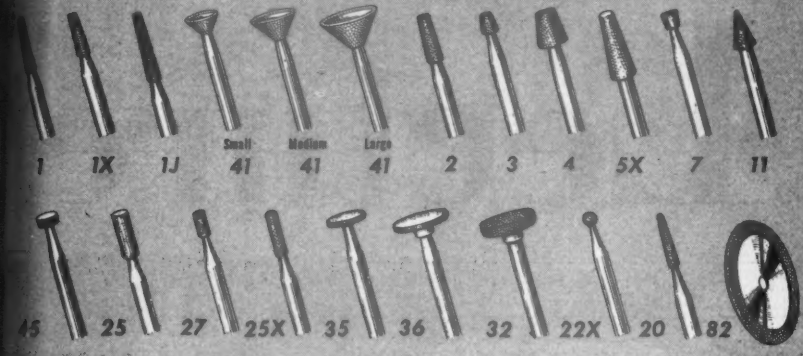

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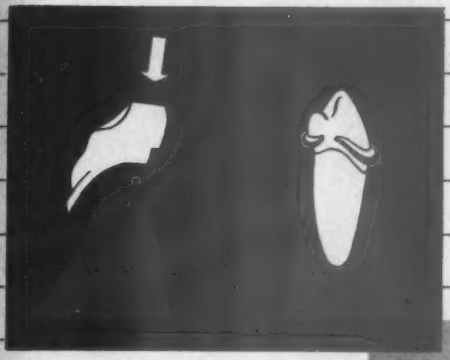
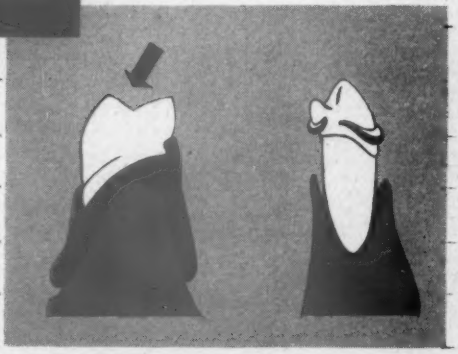


Dr. French's Posteriors help preserve supporting tissue of abutment teeth.



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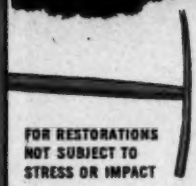

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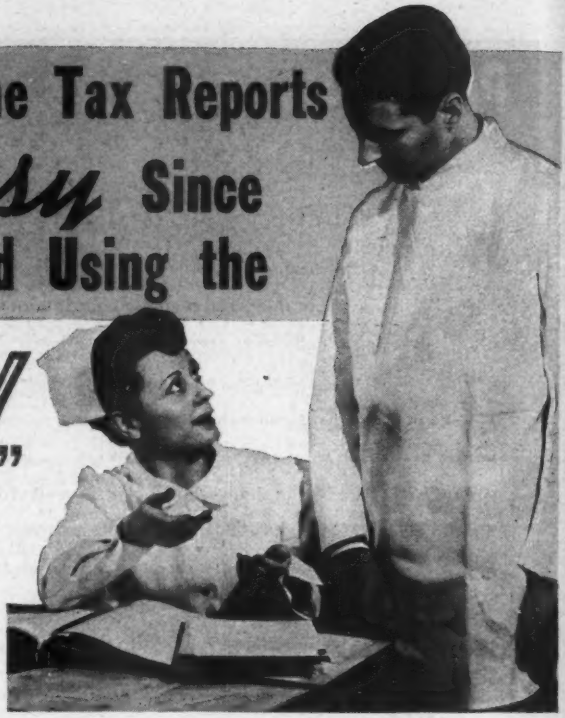

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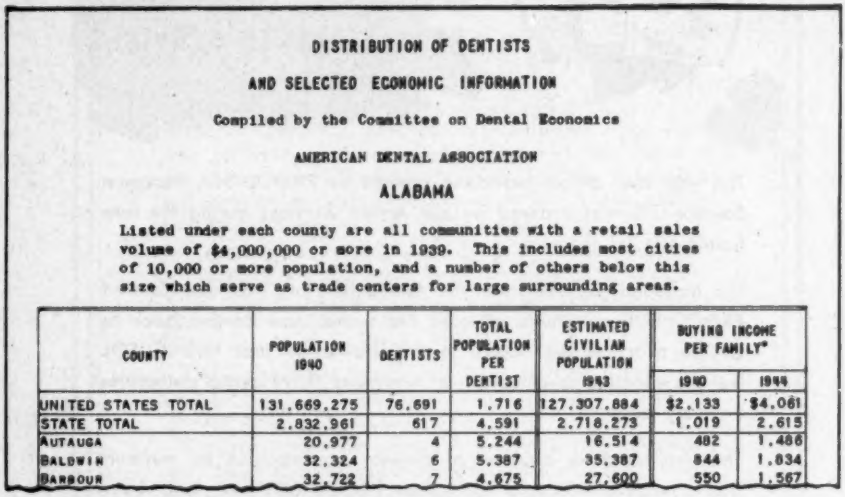

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STATE TOTAL	2,832,961	617	4,591	2,718,273	1,019	2,615
AUTAUGA	20,977	4	5,244	16,514	482	1,486
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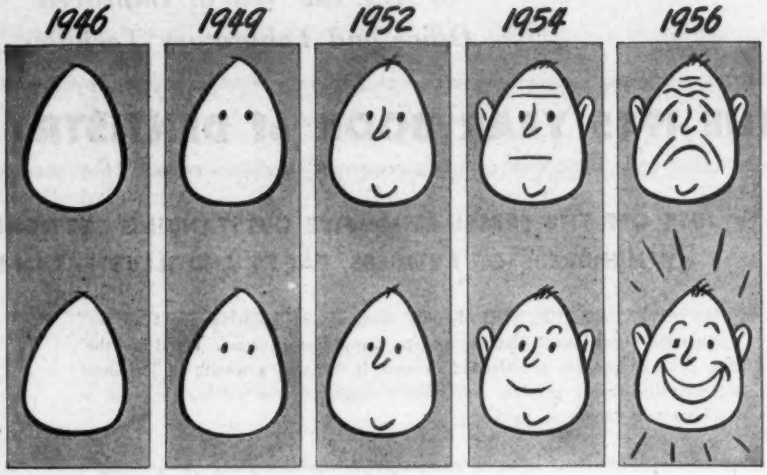

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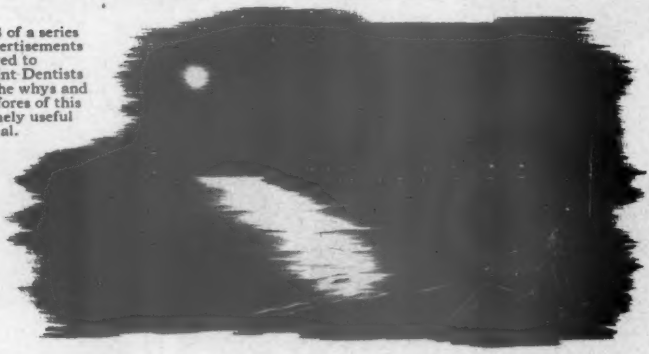

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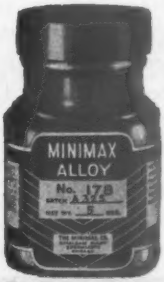

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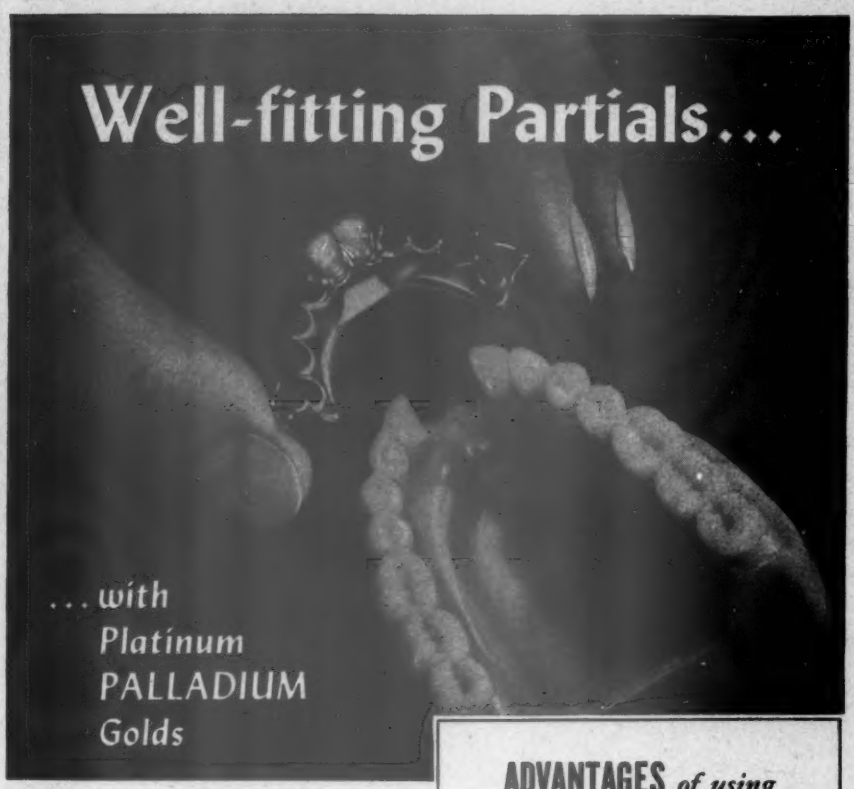

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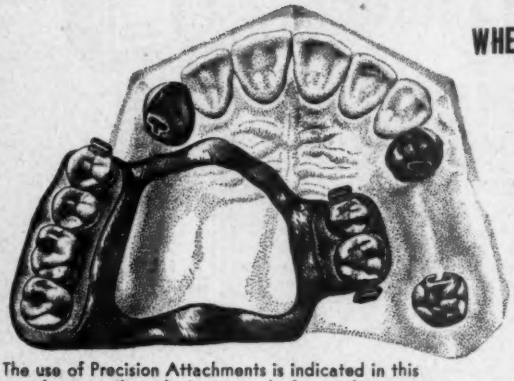

The use of Precision Attachments is indicated in this case because they eliminate need of a cumbersome continuous clasp across anteriors from cuspid to first bicuspid, which would be required in a clasp case in addition to clasps on the three abutment teeth.

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The case illustrated is an example of one in which better practice indicates attachments for the reasons given under the illustration.

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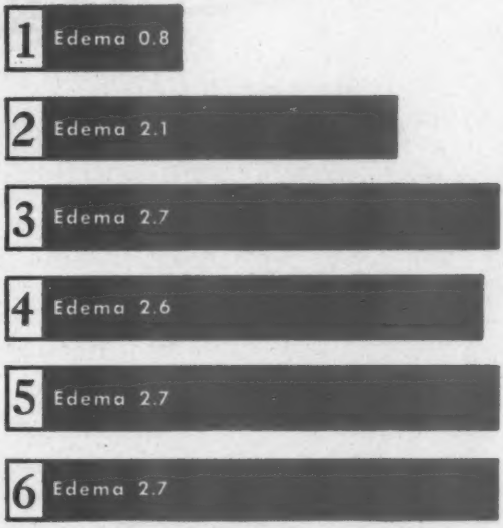
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Cigarettes made by the PHILIP MORRIS method
2 Edema 2.1
Cigarettes made with no hygroscopic agent
3 Edema 2.7
Popular cigarette #1 (ordinary method)
4 Edema 2.6
Popular cigarette #2 (ordinary method)
5 Edema 2.7
Popular cigarette #3 (ordinary method)
6 Edema 2.7
Popular cigarette #4 (ordinary method)

CONCLUSION:* Results show that regardless of blend of tobacco, flavoring materials, or method of manufacture, the irritation produced by all ordinary cigarettes is substantially the same, and measurably greater than that caused by PHILIP MORRIS.

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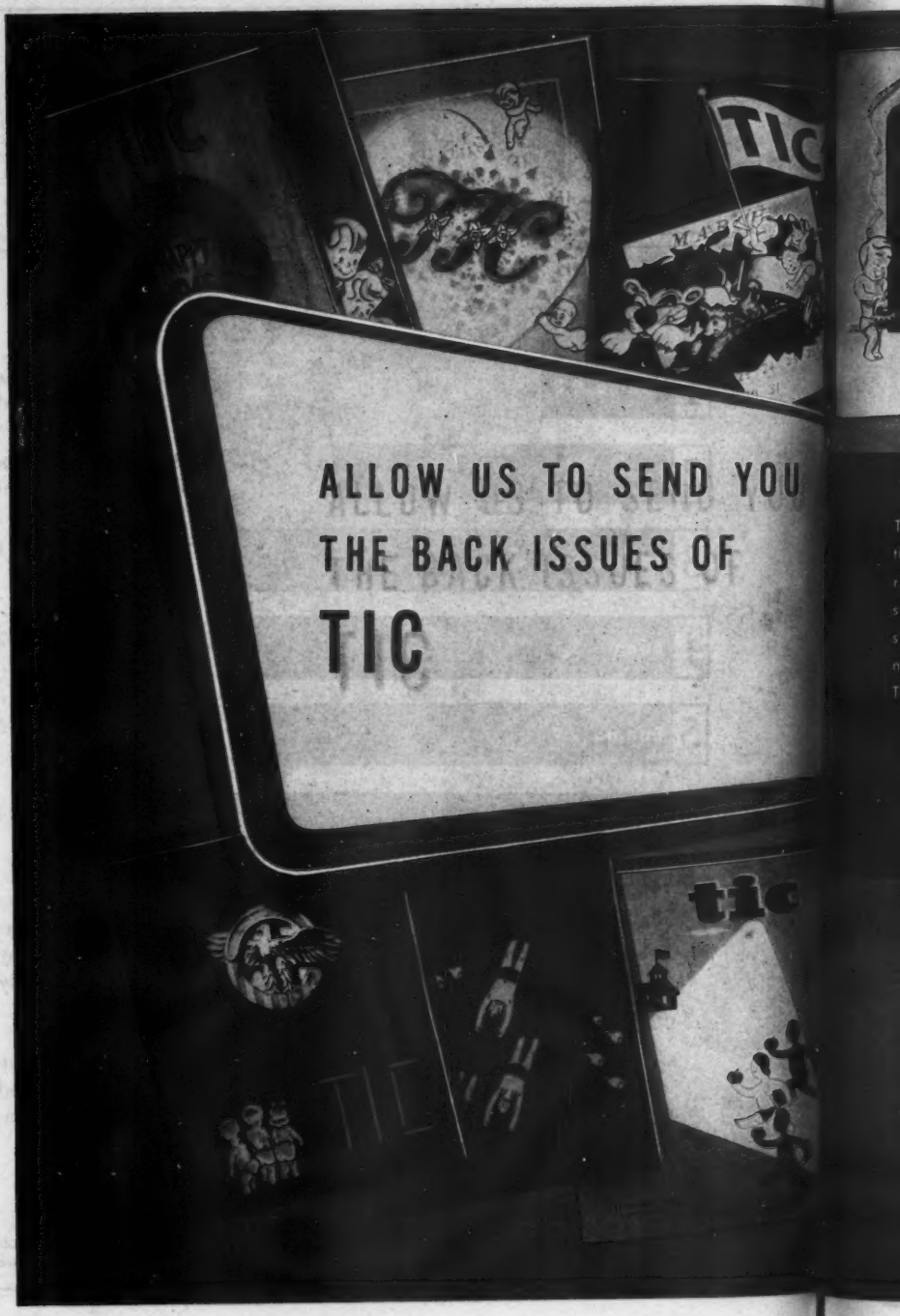
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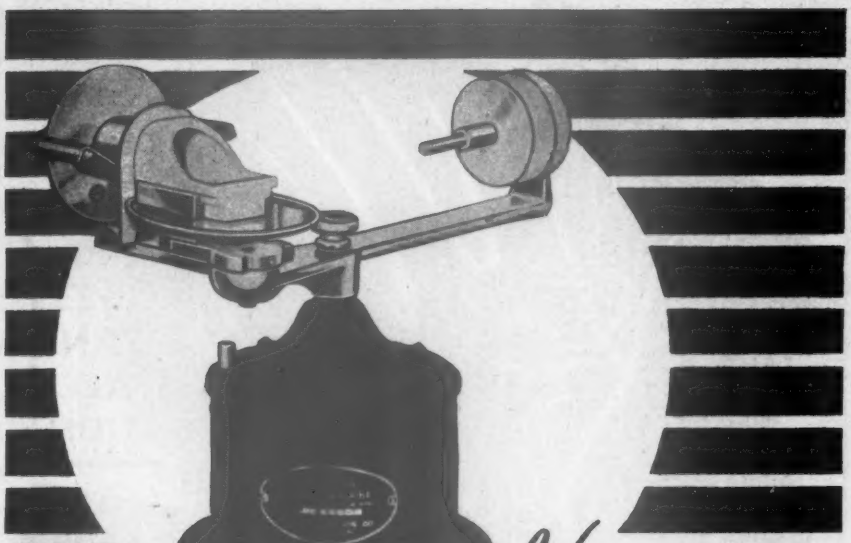

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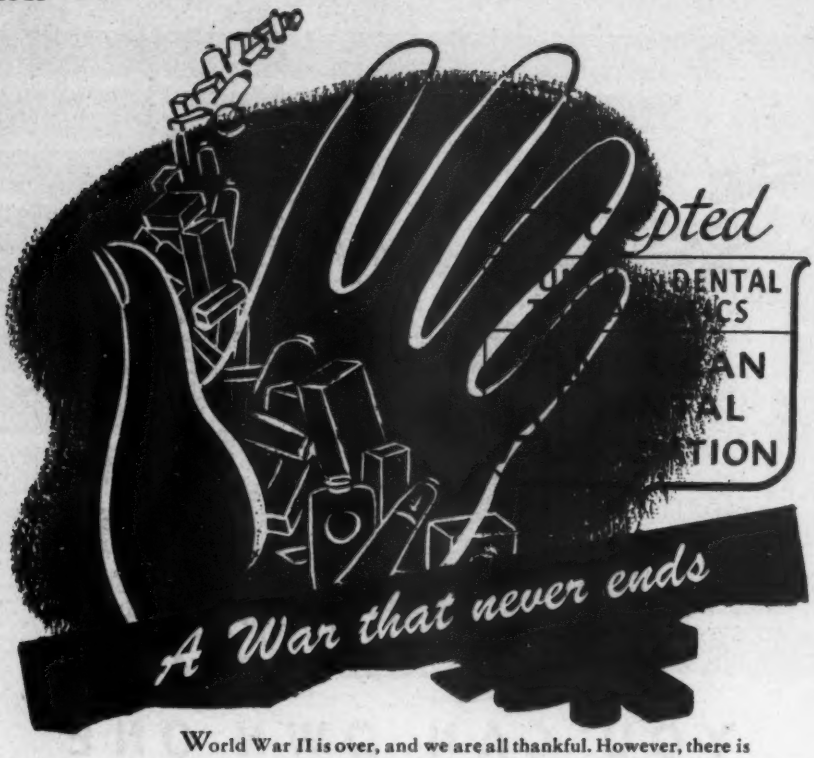

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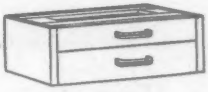

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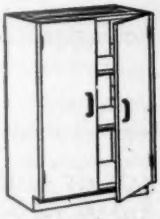

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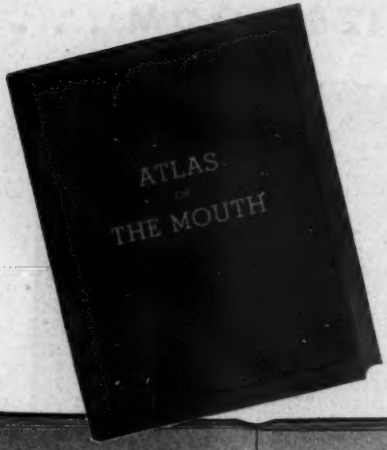

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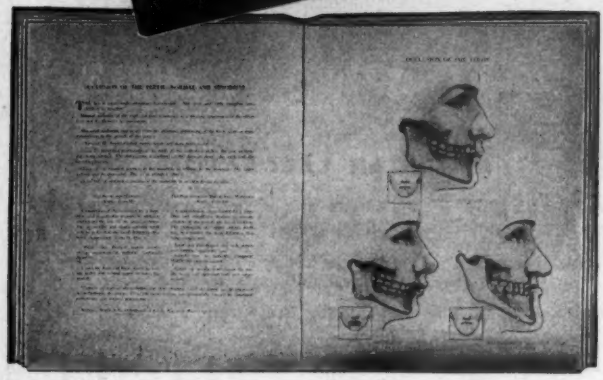

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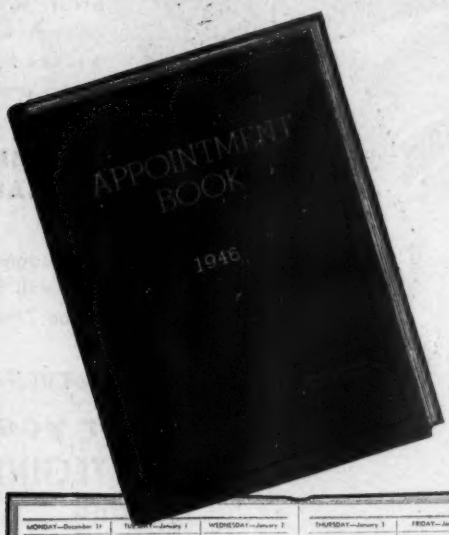

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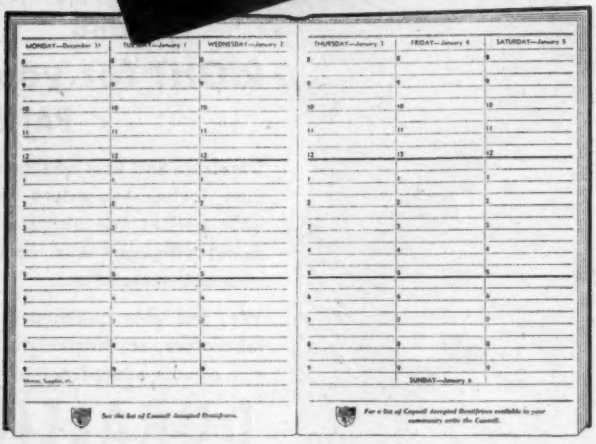

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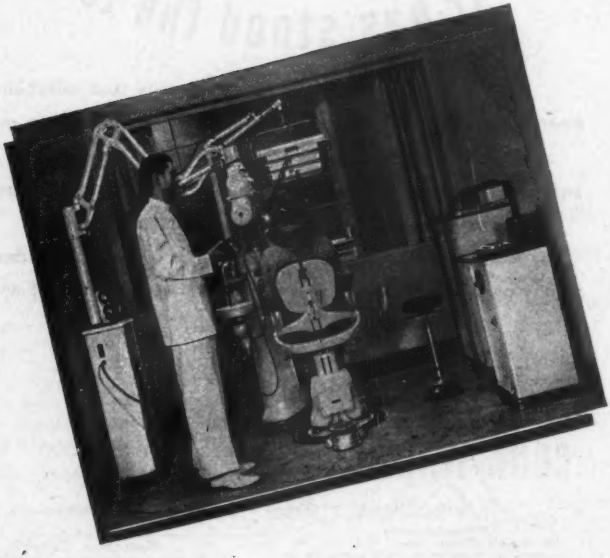

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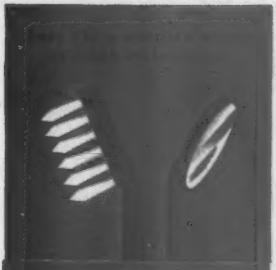

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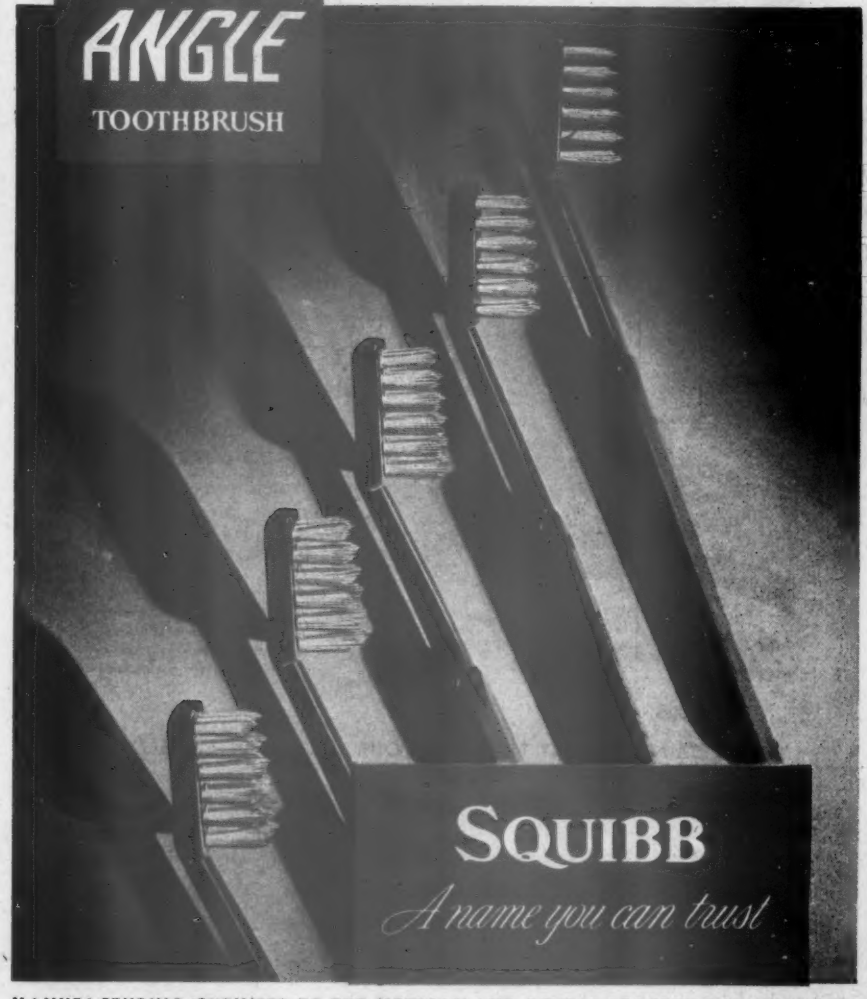

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Forms close on 25th of Second Month Preceding Month of Issue.

Remittance must accompany classified ads.
Effective with the January, 1944 issue, this section will not be open to commercial advertisers.

WANTED: Dentist, Illinois license. Salary and commission commensurate with applicant's qualifications. Dr. G. G. Stirling, 1552 W. Madison St., Chicago 7, Ill.

WANTED: Association with hospital or Oral Surgeon as exodontist and minor Oral Surgeon. Age 36. Twelve years private practice and 2½ years in Navy, being in charge of Surgery in large Dental Dispensary. Wisconsin license. Can give excellent references. Address A.D.A., Dept. 4049.

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PRACTICE WANTED: Young Navy officer being discharged soon desires to buy practice in Oklahoma. Prefer town over 5,000. Address A.D.A., Dept. 4046.

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VETERAN Navy Dentist desires association or purchase of practice. Illinois license or will take other State Board. Detailed qualifications forwarded upon inquiry. 1935 graduate, age 34. All correspondence confidential. Address A.D.A., Dept. 4040.

FOR RENT: Ground Floor office; had been occupied by recently deceased dentist. Large practice. No other dentist in prosperous rural town of 1,000 population. Write Box 294, Fayette, Ohio.

FOR SALE OR LEASE: Dental office located in Washington, Kansas, County seat of Washington County. Excellent location. Equipment is in good condition. Address Mrs. Roy L. Morgan, R.R. 5, Lawrence, Kansas.

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WANTED: Associate for an Orthodontic practice in Chicago. State training, experience, age and further pertinent information. Address A.D.A. Box 4032.

FOR SALE: Chandler No. 75 business unit complete with stationary. Has four drawers—only used 3 months. Cost $100. Will sell for $75. Dr. Ralph Bush, 158 Main Street, Ossining, New York.

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Young dentist recently returned from 4 years' overseas duty with Army is available for immediate appointment; successful private practice before joining Army; degrees from leading schools; year's internship in clinical dentistry. For further information, please write Burneice Larson, Director, The Medical Bureau, Palmolive Building, Chicago 11.

Orthodontist is available; B.S., D.D.S., eastern schools; graduate training in orthodontia for which he received M.S. degree. For further information, please write Burneice Larson, Director, The Medical Bureau, Palmolive Building, Chicago 11.

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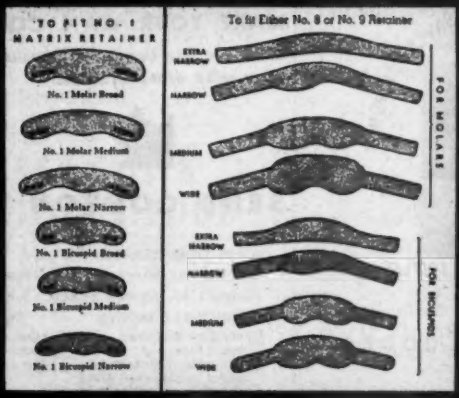

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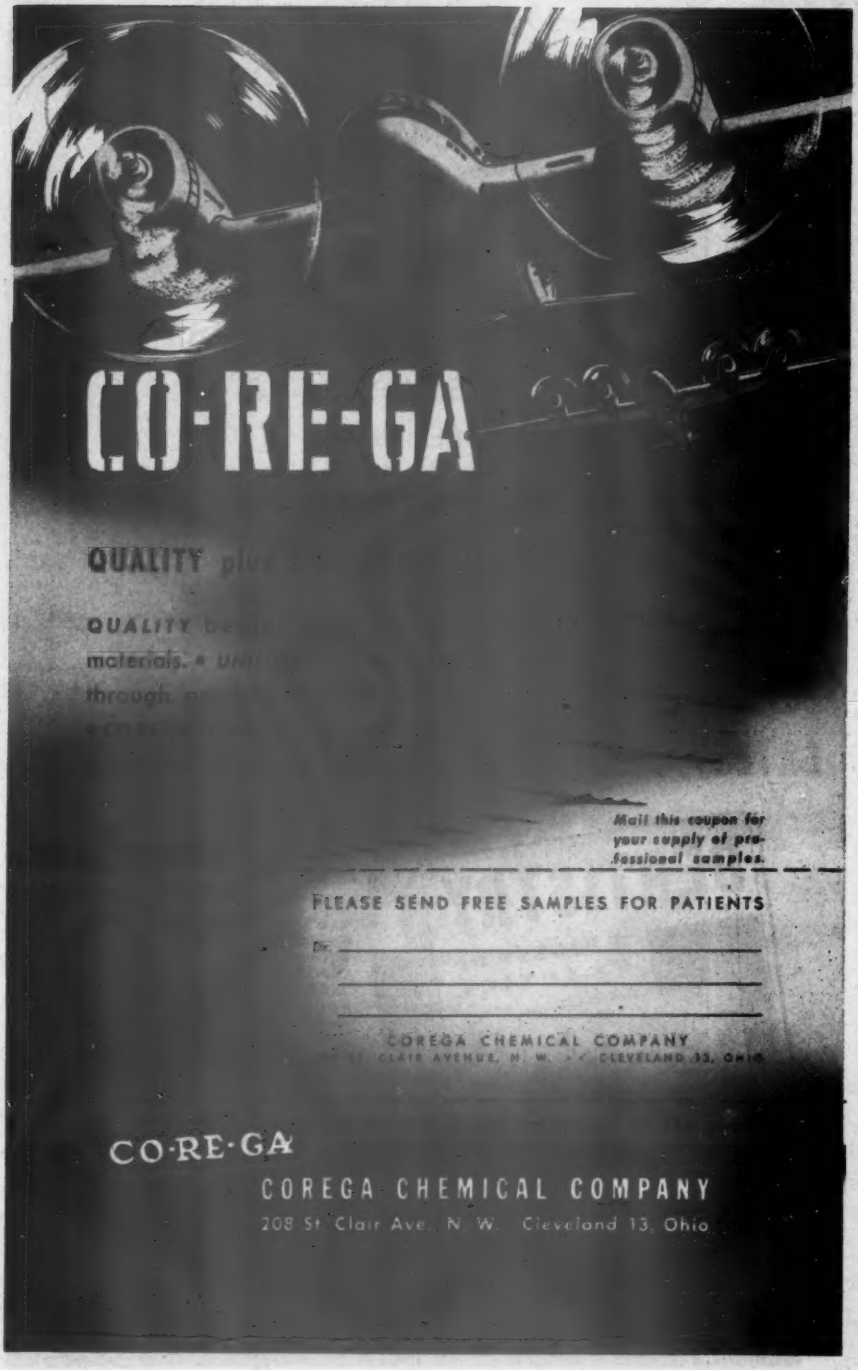
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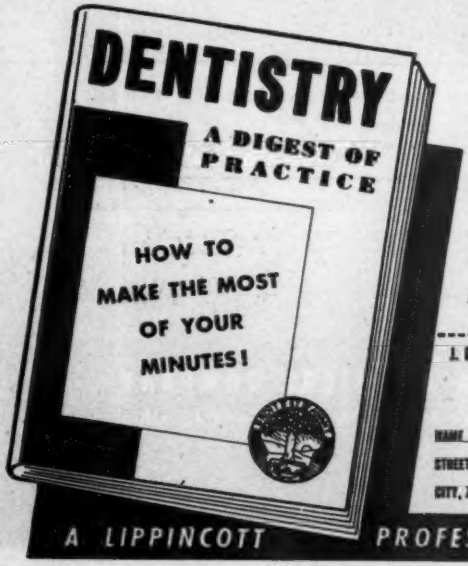

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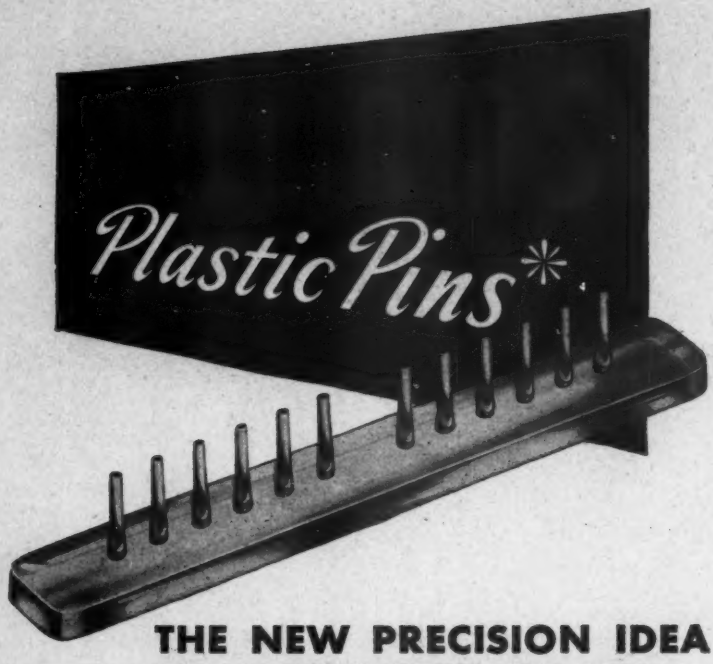

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